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(For Crops other than Herbage)

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Note.—Initialled abstracts are written by the following:

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* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. VII, No. 3.

Part 1. Empire Section

STATISTICS 519

825. ALLAN, F. E. 519.24
Some principles of statistics and their application to agricultural experiments. IV.

J. Aust. Inst. Agric. Sci. 1936 : 2 : 154-62.

This, the concluding article of the series, (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1053 and Vol. VII, Abst. 370), deals with tests of goodness of fit. The use of analysis of variance in testing the goodness of fit to a regression line is explained and illustrated by an example. Next the testing of genetic ratios and other applications of the χ^2 test are described and the article concludes with a brief account of the binomial and Poisson distributions.

826. FISHER, R. A. 519.24:576.16:576.356.5
The use of multiple measurements in taxonomic problems.
Ann. Eugen., Camb. 1936 : 7 : 179-88.

The following problem is considered: when two or more series of data are measured in several characters, what is the best linear function of the measurements to take in order to discriminate between the series? The author considers the ratio of the square of a linear function of the observed mean differences to the variance within species of the corresponding linear function of the measurements, and determines the coefficients which make this ratio a maximum. The problem is illustrated and interpreted by means of data of sepal length and width and petal length and width in *Iris setosa* and *Iris versicolor*, and an analogy is drawn to the theory of partial regression. An extension of the method to more than two series of data is suggested and illustrated by adding data from *Iris virginica* to those already considered.

I. setosa is a "diploid" species with 38 chromosomes, *I. virginica* a "tetraploid" with 70 and *I. versicolor* a hexaploid which, it has been suggested, is derived from a cross between the other two species. The analysis of the data shews that they agree with the hypothesis that *I. versicolor* should stand not midway between the other two species, but twice as far from the diploid as from the tetraploid.

J. W.

827. VAIDYANATHAN, M. 519.241
Two new statistical tables based upon Fisher's *t*.
Misc. Bull. Imp. Coun. Agric. Res. 1936 : No. 13 : Pp. 14.

The first table gives the odds against deviations greater than a given $|t|$ occurring in samples, where t is the ratio of a mean to the estimated standard error of that mean, and ranges from 0.0 to 6.0 for t at intervals of 0.1, and for degrees of freedom from 1 to 20 by integers, and infinity. The second table provides the theoretical number of replications necessary with a given standard deviation and a given percentage difference to be measured, at the two significance levels $P = 0.01$ and 0.05 . An explanation of the use of the tables is furnished. J. W.

GENETICS 575

828. BELL, G. D. H. 575:633
Crops and plant breeding.
J.R. Agric. Soc. 1936 : 97 : 1-35.

An annual survey, beginning with work on grassland and on weed control. Vernalization and related topics are discussed, followed by an account of recent wheat investigations, covering quality, the new winter wheat Holdfast, (bred by the Cambridge Plant Breeding Institute), disease resistance, including the use of interspecific crosses in breeding, and various varietal characters of economic significance. The survey concludes with a consideration of the National Institute of Agricultural Botany variety trials with spring and winter oats.

829. NEWMAN, H. L. 575:633(71)
The science of plant breeding and its significance to Canada.
 Agric. J. Brit. Guiana 1936 : 7 : 237-40.

In this address to the Canadian Society of Technical Agriculturists in 1936 the valuable contribution made by plant breeders to agriculture in Canada and other countries is outlined, the achievements in the production of wheats such as Marquis and Reward, etc., being specially mentioned.

830. SMITH, H. F. 575.42:519.241:633.11
A discriminant function for plant selection.
 Ann. Eugen., Camb. 1936 : 7 : 240-50.

In order to work out a method for selecting plant lines, the value of a plant is expressed as a linear function of its characters. Then using the concept of a "discriminant function", a linear function of observable characters is derived which will be the best available guide to the genetic value of each line. It is shewn how the expectation of "genetic advance" over the mean of the unselected population for any given selection intensity may be estimated, and used to compare the relative efficiencies of various breeding programmes. The calculations are illustrated on the author's data of variety trials with Australian wheat. In particular, arbitrary ratios such as the "migration coefficient" or the "tiller survival rate" are shewn to be inefficient substitutes for the two characters whose ratio is observed, as indices to the genetic value of either.

J. W.

CYTOLOGY 576.3

831. DARLINGTON, C. D. 576.312.38:576.354.4
The external mechanics of the chromosomes (I-V).
 Proc. Roy. Soc. 1936 : 121 : Ser. B. 264-319.

An examination of the meiotic and pollen grain divisions in diploid and triploid *Fritillaria* species with different degrees of localization of chiasmata, to determine the forces concerned in the positions, attitudes and movements of chromosomes. Two types of force are considered to be acting, (1) a specific attraction between homologous chromomeres, causing their association in pairs and (2) repulsions; the two special agents of repulsion are the centrosome (or an analogous agency) and the centromere (spindle fibre attachment chromomere) and in addition there is a general repulsion between all parts of the bodies of chromosomes. The general repulsion causes the even distribution of chromosomes in the nucleus and plays a part in the terminalization of chiasmata, in which process the special repulsion between paired centromeres is also important in many organisms. The centrosome, after its division, determines the formation of the spindle, which transmits repulsions most effectively along its axis, with the result that dividing centromeres (at mitosis) or paired centromeres (in bivalents at meiosis) orientate themselves axially in the spindle. The repulsions from the centrosomes cause them to lie on the equatorial plate.

The broadening of the spindle with the formation of the metaphase plate shews that the centromeres have an influence on the spindle. At anaphase the centrosome repulsions wane, allowing the centromeres to move apart; the two plates of centromeres now form a centromere spindle. The courses of mitosis and meiosis depend on a coordination of the cycles of the three types of bodies, centrosomes, centromeres and chromosomes. The centrosomes and centromeres shew maximum repulsions after division, but the centrosome divides before the centromere by a fraction of a cycle at mitosis and by a whole cycle at meiosis, where the former divides twice to the latter's once. The division of the centromere lags behind that of the chromosome. This theory of the coordination of the different cycles the author terms the "Balance Theory of Mitosis".

832. RICHHARIA, R. H. 576.356.5:576.354.46
The phenomenon of secondary association.
 Curr. Sci. 1936 : 5 : 290-91.

A brief review, supporting the view that secondary association is due to genetic affinity.

BOTANY 58

833. BRYAN, W. W. and MARRIOTT, S. 581.162.32:578.081
The determination of the amount of natural cross-pollination in crop plants.
 J. Aust. Inst. Agric. Sci. 1936 : 2 : 163-64.

It is urged that in determining natural cross-pollination individual plants of one strain should be completely surrounded by plants of the other and widely separated from other plants of the same strain. The tests should be made reciprocally.

FIELD TESTS 631.421

834. GOSSET, W. S. 631.421
Co-operation in large-scale experiments.
 Suppl. J. Roy. Statist. Soc. 1936 : 3 : 115-36.
 BARBACKI, S. and FISHER, R. A.
A test of the supposed precision of systematic arrangements.
 Ann. Eugen. Camb. 1936 : 7 : 189-93.
 "STUDENT"
The half-drill strip system agricultural experiments.
 Nature, Lond. 1936 : 138 : 971-72.
 FISHER, R. A.
The half-drill strip system agricultural experiments.
 Nature, Lond. 1936 : 138 : p. 1101.

In the first paper W. S. Gosset ("Student") summarizes experimental methods in use in the past, particularly where trials were conducted over a period of time, or at a number of centres. He enters a plea for more extensive co-operative experiments. The authors of the second paper examine the yield data for 1,500 15 ft. rows of wheat, and shew that in this example the half-drill strip method of experimentation, advocated by "Student", would have led to a bias in the calculation of the experimental error. "Student" in a letter, points out that the previous authors treated as separate half-drill strips what were in reality different sections of the same strip, which are far from independent. In reply, Fisher restates the object of the enquiry conducted by Barbacki and himself, which was to test the truth of the opinion that randomization achieves its object "usually at the expense of increasing the variability when compared with balanced arrangements".
 J. W.

835. BARBARD, M. M. 631.421:519.24
An enumeration of the confounded arrangements in the $2 \times 2 \times 2 \dots$ factorial designs.
 Suppl. J. Roy. Statist. Soc. 1936 : 3 : 195-202.

A complete enumeration is made of the treatment combinations in a factorial design of the 2^4 type in field experiments. The structure of the 2^n system is considered in relation to the possible confounding of treatment comparisons, and illustrations are provided up to 2^6 .
 J. W.

836. VASEY, A. J. 631.421:519.24
Non-replicated factorial experiments.
 J. Aust. Inst. Agric. Sci. 1936 : 2 : 174-75.

A brief note emphasizing the value of such experiments (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 391).

837. MILES, L. G. and BRYAN, W. W. 631.421:519.24:633.15
The analysis of co-variance and its use in correcting for irregularities of stand in agricultural trials for yield.
 Proc. Roy. Soc. Qd. 1936 : 48 : No. 4.

The method is illustrated by its application to a maize variety trial in which the seed of certain varieties had been damaged by weevil. The results obtained when the varietal yields were adjusted for irregularities in stand were in better agreement with previous experience of the varieties than were those based on the unadjusted yields.

838. BOSE, S. S., GANGULI, P. M. and
MAHALANOBIS, P. C. 631.421:519.24:633.18
**Statistical notes for agricultural workers. No. 19. The frequency
distribution of plot yields and the optimum size of plots in a uni-
formity trial with rice in Assam.**
Indian J. Agric. Sci. 1936 : 6 : 1107-21.

The authors present data of a uniformity trial with rice shewing conformity with the normal law of distribution. Errors were calculated for plottings of various multiples of the unit plot, which was 5 feet x 5 feet. Elimination of variation due to systematic differences in soil fertility led to an appreciable decrease in the residual errors. Some evidence of competition between rows was found. The smallest residual error occurred in the case of plots 30 feet x 20 feet (1/72 acre). Considered, however, from the point of view of efficiency of land utilized, the best size is the smallest, 5 feet x 5 feet, although there is little to choose between this size and those of 5 feet x 30 feet or 15 feet x 20 feet. It is concluded that fairly small-sized plots (less than 1/100 acre) are statistically quite efficient for experiments on rice. J. W.

839. CHAKRAVARTI, S. C., BOSE, S. S. and
MAHALANOBIS, P. C. 631.421:633.18
**Statistical notes for agricultural workers. No. 21. The effect of
different methods of harvest on the estimated error of field experi-
ments on rice.**
Agric. Live-Stk. India 1936 : 6 : 814-25.

In randomized block variety trials with three types of rice, Aus, Early Aman and Aman, six sets of yield records were obtained, based on (1) 100 plants from each plot, (2) plants from the area which with a full stand would be occupied by 100 plants, (3) border plants only (two outer rows all round the plot), (4) plants in the hollow rectangle left after removing the border and the central area of 100 plants, (5) whole plot less border and (6) whole plot with border.

The border plants gave significantly higher yields; the increase was about the same for different varieties in the Aman class and also in the Early Aman, but among the Aus varieties it varied considerably. As there were few deaths, yields (1) and (2) gave about the same result. For a given experiment the standard deviation expressed as a percentage of the mean was about the same in the six different methods of harvesting.

It is considered that the safest method was the 100-plant area method.

PLANT DISEASES 632

840. 632.452 *Puccinia Helianthi*:576.16:633.854.78:581.162.5
BROWN, A. M. 632.452 *Puccinia Helianthi*:575.12
Studies on the interfertility of four strains of *Puccinia Helianthi* Schw.
Canad. J. Res. 1936 : 14 : Sect. C : 361-67.

Four distinct strains of *P. Helianthi* were obtained from *Helianthus annuus*, *H. petiolaris*, *H. tuberosus* and *H. subtuberosus* respectively. By crosses of all combinations of these four strains it was shewn that, using the formation of aecia as a criterion of interfertility, these strains form two groups, the two strains in each being highly interfertile within their group and highly intersterile outside the group. These results were confirmed by the diploidization method.

The question of the identity of the four different strains in relation to Bailey's differential species is considered as well as the possibility that each of the two aforementioned groups may merit varietal rank.

WHEAT 633.11

841. 633.11:575(71.24)
633.11-2.452-1.521.6:575.127.2
HARRINGTON, J. B. 633.11 Apex
Apex, a new wheat highly resistant to stem rust.
Circ. Coll. Agric. Univ. Saskatch. 1935 : No. 534 : p. 1. (Mimeographed).

A brief account of the qualities of Apex, a new stem-rust resistant wheat of high quality and

yield, bred by the author at the University of Saskatchewan. It was selected from a cross between Marquis and H-44 x Double Cross F_1 hybrids, and its pedigree therefore includes the resistant parents Yaroslav emmer, Tumlillo (*T. durum*), and Kanred.

842.

TORRIE, J. H.

633.11:575.11

633.11-2.112-1.521.6

Inheritance studies of several qualitative and quantitative characters in spring wheat crosses between varieties relatively susceptible and resistant to drought.

Canad. J. Res. 1936 : 14 : Sect. C : 368-85.

The F_2 and F_3 generations of the crosses Selection I-28-60 x Milturum, Reward x Caesium and Caesium x Marquis and certain F_4 lines of Reward x Caesium were used in this experiment, and the results are discussed in the light of the work of various other investigators.

Awedness, straw colour, pubescent glume and regularity of the spike (i.e. the typical arrangement parallel to the rachis as opposed to at an angle with the rachis) all proved to be monofactorially conditioned. Glume colour was determined by two factor pairs in the *Reward* x *Caesium* and the *Caesium* x *Marquis* crosses, and by either one or two factor pairs in the Selection I-28-60 and Milturum cross.

Purple straw was partially dominant to white and irregular spike to normal.

Inheritance of grain yield, earliness and strength of straw was apparently controlled by polymeric factors and earliness shewed partial dominance.

Glume colour and pubescence, awning, colour of straw and spike regularity were independently inherited, but straw colour was correlated with earliness and with plant height in certain crosses.

Indications were found that the genetic basis of plant height differs in *Reward* and *Marquis*.

No significant correlation was found between grain yield and strength of straw, plant height or earliness. A strong positive correlation was found between maturity and heading.

The findings of other workers with reference to correlated inheritance are discussed and relevant literature is cited.

843.

KADAM, B. S.

633.11:575.127.2:575.11

Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli. Part I.

Proc. Indian Acad. Sci. 1936 : 4 : Sect. B : 357-69.

Crosses were made between the wheats Bansi 162 and 167—pure line selections from Bansi (*Triticum durum*)—and Kala-Khapli 568, a strain derived from a natural hybrid found in a crop of cultivated Khapli (*T. dicoccum*). The Bansi parents had glabrous red glumes, red awns and yellow grains while Kala-Khapli 568 had pubescent white glumes, black awns and red grain. The inheritance of these characters was studied.

Pubescence of glumes is due to a single dominant factor P and red grain is produced by a single dominant factor R_1 . Black awn colour was dominant to red in F_1 and in F_2 12 black: 3 red: 1 white were produced, indicating the operation of two factors, B and R_{g-a} , B producing black awns and being epistatic to R_{g-a} which produces red awns in the presence of b . R_{g-a} was also responsible for monogenic segregation for glume colour. P and B are completely linked; apart from this and the interaction noted above, the factors mentioned are independent of each other.

Kala-Khapli 568 differs from Khapli in that the latter has glabrous white glumes and awns. Since Baxi (*T. durum*) is the only variety with black awns and pubescent glumes grown as an irrigated crop like Khapli in the Bombay Presidency, it is argued that Kala Khapli 568 is derived from a cross between Baxi and Khapli. This is supported by the absence of segregation for awn colour or glume pubescence in a cross between Baxi and Kala-Khapli 568.

844.

KOSTOFF, D.

633.11:575.127.5

The genomes of *Triticum Timopheevi* Zhuk., *Secale cereale* L. and *Haynaldia villosa* Schur.

Curr. Sci. 1936 : 5 : p. 340.

An editorial note pointing out that in the article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 403, the word "genom" was wrongly changed to "gene" in the title and throughout the text.

845. McMILLAN, J. R. A. 633.11-2.19-1.521.6:575.11
"Firing"—a heritable character of wheat.
 J. Coun. Sci. Industr. Res. Aust. 1936 : 9 : 283-94.

Firing, which is presumed to be a physiological defect, consists in the death (occurring about flowering time) of the uppermost laminae of the leaves and sheaths, which are affected as a whole and not progressively from the tip backwards.

Analysis of data obtained from crosses made with 19 varieties of wheat indicated that firing is a dominant character determined by complementary factors of which there are assumed to be three pairs operating $F_a f_a$, $F_b f_b$ and $F_c f_c$. Fired plants would presumably have at least one of each pair dominant and all other genotypes would result in the development of normal plants. Cadia, Cleveland and Federation, which are among the parent varieties analysed, are allotted the following genotype $F_a F_a$, $f_b f_b$, $f_c f_c$, while Shepherd has $f_a f_a$, $F_b F_b$, $F_c F_c$. The probable constitution of certain other varieties is given.

846. 633.11-2.451.3-1.521.6:575
 MILLER, W. B. and 633.11.0014(94.5)
 HORE, H. L. 633.13.0014(94.5)
Mallee wheat tests. Research station results.
 J. Dep. Agric. Vict. 1936 : 34 : 505-16.

The results of variety trials at the Mallee station, of wheat and oats including some new selections and hybrids are briefly reported, with a short note on the method of cereal breeding at the Werribee Research Farm. Some 30 wheat and 10 oat selections are now ready for multiplication to obtain seed for replicated plot tests.

The performance of a large number of wheats in flag smut reaction tests is tabulated and shews one very promising and comparatively resistant group. All the commonly grown varieties and many new hybrids have been similarly classified. Ghurka, a high yielding wheat, has proved resistant to the disease.

OATS 633.13

847. 633.13:575(42.9)
Survey of the work of the agricultural departments.
 University College of Wales, Aberystwyth 1936 : Pp. 135.

The survey includes a brief account of the work on oat breeding at the Welsh Plant Breeding Station (Cf. "Plant Breeding Abstracts", Supplement II, pages 11-12.)*

848. PARKER, W. H. 633.13:581.48:575(42)
Huskless oats.
 Agric. Quart. J. Herefordshire County Counc. 1936 : 4 : 175-77.

In a series of six trials in 1936 conducted by the National Institute of Agricultural Botany in which Parker's Huskless oat (Cf "Plant Breeding Abstracts", Vol. VI, Abst. 1073 and Vol. VII, Absts. 27 and 28) was compared with Victory, 28 per cent being deducted from the grain yield of the latter to allow for its husk, the Huskless oat was out-yielded by an average of 41.2 per cent.

MAIZE 633.15

849. RHOADES, M. M. 633.15:575.113.42.061.63
The effect of varying gene dosage on aleurone colour in maize.
 J. Genet. 1936 : 33 : 347-54.

The dominant gene Dt gives, in the presence of the recessive gene a_1 and the dominants C , R , and A_2 , coloured dots on otherwise colourless aleurone. Seeds homozygous for a_1^p , an allelomorph of a_1 producing pale-coloured aleurone, have no dots in the presence of Dt . The effects of different doses of a_1 on the number of dots was studied. From crosses of $a_1 a_1^p Dt Dt$ x $a_1 a_1 dt dt$ seeds were obtained of the constitution $a_1 a_1 a_1^p Dt Dt dt$ (colourless aleurone with dots) and $a_1 a_1^p a_1^p Dt Dt dt$ (pale aleurone with dots) and it was found that the former class carried on the

* "Summary of Reports received from stations in the British Empire, 1932-35". 5s. 0d.

average three times as many dots as the latter. Similarly from the cross $a_1a_1DtDt \times a_1a_1^pdt dt$ were obtained seeds with the constitution $a_1a_1a_1^pDtDt dt$ (pale aleurone with dots) and $a_1a_1a_1DtDt dt$, the latter carrying half as many dots again as the former. The effect of a_1 genes is therefore additive.

By comparing the number of dots per seed obtained from the cross $a_1a_1DtDt \times a_1a_1dt dt$ and reciprocal it was found that $a_1a_1a_1DtDt dt$ seeds produced about four times as many dots as $a_1a_1a_1DtDt dt$ seeds, the actual averages being 45.4 and 10.4. In seeds of a related line with three Dt genes present an average of 185.0 dots were produced per seed. The effect of increasing the number of Dt genes present is therefore more nearly exponential than additive. Further data confirming the additive effect of a_1 genes were also obtained.

850. RHOADES, M. M. 633.15:576.356.5

Note on the origin of triploidy in maize.

J. Genet. 1936 : 33 : 355-57.

A triploid individual arose from a cross between a female parent homozygous for the gene glossy 1 (gl_1) and a male parent homozygous for white sheath 3 (ws_3). Crossing the triploid to a homozygous glossy male gave 89 non-glossy to 20 glossy plants in F_1 suggesting that the triploid carried $Gl_1Gl_1gl_1$. In crosses between the triploid and females homozygous for white sheath 3 the F_1 consisted of 42 non-white sheath to 90 white sheath plants, indicating that the triploid carried $Ws_3ws_3ws_3$. It is therefore concluded that the double set of chromosomes came in this case from the male parent.

851. GANGULY, B. D. 633.15:581.2:581.46

Notes on floral monstrosities in maize (*Zea mays* L.).

Curr. Sci. 1936 : 5 : 302-04.

Two abnormalities are described. In the first the tassel hangs down, bent in the form of an S and bears functional stamens only near the tip, fertile ovules occurring with abortive stamens in the remaining flowers; the lateral cobs were found to be completely devoid of kernels or vegetative buds. This is inherited as a dominant character. In the second abnormality the axis of the cob is much shortened and the flowers are replaced by vegetative buds, the whole globular cob being incompletely covered by 8-10 husks.

BARLEY 633.16

852. PETO, F. H. 633.16:576.356.5:581.036.1

Heat induced tetraploidy in barley.

Canad. J. Res. 1936 : 14 : Sect. C : 445-47.

The meiotic divisions were examined in 20 plants of O.A.C. 21 barley ($2n = 14$) which had been germinated and grown for seven days at 35° C. and subsequently grown under normal conditions. One side of the spike of one of them was found to be tetraploid, the rest being normal diploids. In twelve tetraploid nuclei analysed the number of quadrivalents varied from 1 to 7 with a mean of 3.58, two univalents occurring in one cell; the average chiasma frequency was 26.08, with 22.17 terminal. In twelve diploid cells from the same spike and therefore subject to similar genotypical and environmental control, there were regularly 7 bivalents, the average chiasma frequency being 13.92, with 10.41 terminal. The chiasma frequency in the tetraploid was therefore very nearly double that of the diploid. No trivalents or single univalents were observed in the tetraploid cells.

All the tetraploid material was used for cytological examination, otherwise it is considered that a tetraploid strain could have been established.

853. 633.16:581.46.061.5:575(71.24)

HARRINGTON, J. B.

Regal, the new smooth awned barley.

Circ. Coll. Agric. Univ. Saskatch. 1935 : No. 530 : Pp. 3. (Mimeographed).

Regal is well suited for growing for weed control and for feeding. It originated in a line obtained by the University of Saskatchewan from Minnesota, its parents being Manchuria and Lion, the latter a smooth-awned, six-rowed, black-grained variety from southern Russia.

MILLETS AND SORGHUMS 633.17

854. RANGASWAMI AYYANGAR, G. N. and
 ACHYUTHA WARIAR, U. 633.171:575.113.4.061.634
Albinism in *Eleusine indica* Gaertn.
 Curr. Sci. 1936 : 5 : p. 301.

In *E. indica* occurring in importations of ragi from Africa segregation of albinos occurred in the ratio 15 green: 1 albino. Some of the resulting green plants produced all green seedlings, some gave 15: 1 segregation again and others gave 3 : 1 segregation. There are thus duplicate factors for chlorophyll production as in *E. coracana* (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 345).

855. RANGASWAMI AYYANGAR, G. N. and
 ACHYUTHA WARIAR, U. 633.171:575.113.5.061.6
An African Ragi, *Eleusine coracana* Gaertn.—the finger millet—with a violet purple colour.
 Madras Agric. J. 1936 : 24 : 363–65.

In an African variety from Nyasaland was found a violet-purple coloration associated with an uneconomic type of growth. The new colour was found to be due to a single dominant gene *Vt* which will change the pigment colour in any of the four types of purple (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 172 and Vol. IV, Abst. 544) though the effect is feeble in the case of localized purple.

The dominant gene is absent in Indian varieties; it has probably been selected out, because of its unfavourable effect on the economic characters.

856. RANGASWAMI AYYANGAR, G. N.,
 SANKARA AYYAR, M. A., PANDURANGA RAO, V. and
 KUNHIKORAN NAMBIAR, A. 633.174:575.11:581.48
Inheritance of characters in sorghum—the great millet. IX.
Dimpled grain.
 Indian J. Agric. Sci. 1936 : 6 : 938–45.

The dimpled character typical of a few varieties behaves as a simple recessive to normal non-dimpled grain. Dimpled grains have smaller starch grains and contain about three times the quantity of reducing sugars present in the non-dimpled grains. The pollen grains of the former stain light blue and of the latter deep blue, with iodine. B. P. P.

857. RANGASWAMI AYYANGAR, G. N.
 PANDURANGA RAO, V. and PONNAIYA, B. W. X. 633.174:581.148:575.11
Deciduous sessile spikelets in sorghum.
 Curr. Sci. 1936 : 5 : 299–300.

Shedding of the sessile spikelets occurring in a wild African sorghum proved to be a simple recessive, giving 3 : 1 segregation in crosses with non-shedding, cultivated races. The gene responsible for shedding is designated *sh*.

858. RANGASWAMI AYYANGAR, G. N. and
 PONNAIYA, B. W. X. 633.174:581.162.51:575.11
The occurrence and inheritance of earheads with empty anther sacs in sorghum.
 Curr. Sci. 1937 : 5 : p. 390.

Empty anthers were found in M.S. 1761, a variety of *S. durra* Stapf from the Chittoor district of the Madras Presidency. The character behaves as a simple recessive, designated *ms*, as it causes male sterility.

RICE 633.18

859.

KADAM, B. S.

633.18:575(54.7)

A new strain of mid-late Kolamba rice.

633.18 Kolamba 540

Curr. Sci. 1937 : 5 : 389-90.

The new strain, K (Kolamba) 540, which is here described, is a high-yielding, mid late, fine grained rice, and is proving very popular in the Thana district of the Bombay Presidency. It was selected from a cross between K 226, late, fine grained, high yielding and K 164, mid-late, coarse but long-grained.

860.

RAM, K. and EKBOTE, R. B.

633.18:582(54.5+54.3)

The classification of the autumn rices of the Punjab and western United Provinces.

Indian J. Agric. Sci. 1936 : 6 : 930-37.

Forty one lines of rice are classified according to the system previously used at Pusa for classifying the Bihar rices (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 566).

B. P. P.

861.

BANERJEE, K. C., BOSE, S. S. and

MAHALANOBIS, P. C.

633.18-1.547.2:519.24

Statistical notes for agricultural workers. No. 20. Studies in tiller variation.

Indian J. Agric. Sci. 1936 : 6 : 1122-33.

This is a study of the range of variation in number of tillers from plant to plant of a given variety of rice, of the nature of the distribution of tillers, and of the effect of soil heterogeneity on tiller numbers. It was found that the mean number of tillers per plant based on a sample of 90 within a plot of 1/250 acre ranged from 3.9 to 9.3, while the standard deviation ranged from 1.0 to 2.2. The tiller numbers within plots of 1/250 acre did not shew appreciable heterogeneity, although this was manifest between rows of plots. The distribution of tiller numbers was not normal.

J. W.

ROOTS AND TUBERS 633.4

862.

MORRIS, L. E.

633.42:581.162.5:576.312.35

633.42:575.127.5

Pollen germination in *Brassica chinensis* x *Raphanus sativus* F₁ hybrids.

J. Genet. 1936 : 33 : 435-41.

F₁ hybrids with 19 chromosomes from the cross *Brassica chinensis* (n = 10) x *Raphanus sativus* (n = 9) produce a considerable proportion of diploid pollen, by restitution nuclei occurring at meiosis. Though the pollen of these F₁ hybrids was capable of giving high percentages of germination on stigmas of certain plants, e.g. swede, *B. carinata* x radish, and *B. carinata* x cabbage, it gave low percentages of germination on its own F₁ stigmas. Moreover, pollen of radish, *B. chinensis* and swede gave high percentages of germination on the F₁ stigmas. The sterility of the F₁ plants is therefore attributed to the disturbance of the n : 2n chromosome balance between pollen and style (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 325).

FIBRES 633.5

863.

EVELYN, S. H.

633.51:575(72.98)

The work of the Empire Cotton Growing Corporation in St. Vincent, B.W.I.

Rep. 3rd Annu. Gen. Mtg West Indian Sea Island Cott. Ass. 1936 : 24-34.

Dealing with the early work on cotton in St. Vincent the author mentions the introduction of the system of pedigree row selection and self-fertilization and the isolation of several strains by Harland, including V. 135 which is now the only strain grown commercially on the island and produces the longest, finest and strongest lint in the world. Harland also isolated strains resistant to angular leaf spot and shedding, and studied the genetics of many cotton characters.

He left for England in 1920 and the maintenance of the pure strains was carried on by Mason and later by Burd until in 1926 the Corporation's station was temporarily closed.

From 1926 to 1930 both V. 135 with its extra-long staple length of $2\frac{1}{4}$ inches or 57 to 60 mm. and BD with a staple length of 2 inches or 51 mm. were grown on the island often side by side, and owing to cross-pollination they deteriorated. Many of the station strains also became contaminated and in 1930 the Corporation re-opened their St. Vincent station, under the technical control of Harland with the author as Cotton Research Officer. As it appeared impossible to grow both BD and V.135 and maintain the purity of each it was decided that the latter should be grown exclusively. Pure strains were accordingly isolated, multiplied and distributed and since then the seed for the island has been produced each year by the station. Selection has been applied to increase the number of bolls and decrease shedding and the productivity of the variety has been improved, though it is not known whether this is a direct or an indirect effect.

Hybridization with the Peruvian perennial tree cotton, Trinidad Red Kidney and with Montserrat Sea Island has also been employed. The character red body-weak corolla spot was transferred from Trinidad Red Kidney to V. 135 by the back-cross method with the object of producing a Red V. 135 in which rogues or off-type plants could easily be detected by their green body in commercial fields and eliminated, the purity of the commercial crop being therefore easily maintained. Several such strains have been obtained and though they will need to be improved in respect of spinning properties and number of bolls per plant, they are superior to V. 135 in weight of lint per seed and per boll and ginning percentage. The long lint of V. 135 has been transferred to Montserrat Sea Island, again using the back-cross method, to take advantage of the greater productivity of the latter strain and here again the results to date are very encouraging.

An attempt is also being made to isolate strains with high lint weights from V. 135 by straight selection and self-fertilization.

Work is also being carried out on the perennial cotton suitable for cultivation in the drier West Indies. In Carriacou, the largest island-grower of these cottons in the West Indies it was found that the commercial cotton designated Marie Galante was composed of the Peruvian type (*Gossypium barbadense*) and the Bourbon type (*G. purpurascens*), both of inferior quality. A Brazilian cotton of the Bourbon type, known as Moco, appeared to offer a solution to the problem. By selection and selfing, strains pure for a staple length of 48 mm. and free from the recessive gene for naked seeds were obtained, but they had weak lint. Meanwhile a cotton had been found in Carriacou from which a variety known as Antilles was produced at the station, vastly superior to the existing types in length, quality and yield of lint. Efforts are being made to combine the valuable characters of Moco with those of Antilles and other Bourbon types.

Ishan cotton, cultivated in Nigeria, has been improved in yield and quality by the transference of V. 135 characters and many of the improved strains have been sent to Nigeria for trial.

The improvement of the South African cotton U.4 has also been attempted by hybridization with such types as Cambodia, Galapagos, Jamaica Xerophytic, Upland and Gambia and subsequent back-crossing to the U.4 parent. The back-crosses were sent from Trinidad, where the work was started, to St. Vincent where they were observed for many characters, particularly hairiness, yield and resistance to pests. They were then selfed and seeds sent to different parts of Africa for testing, 1,633 strains being distributed in all and some of them have given very promising results.

Another method of improving U.4 has been the transference of certain genes from Asiatic cottons. Harland found that the hybrid (Sea Island x Egyptian F_1) x Red-flowered Asiatic *arboresum* was partly fertile on the male side and by repeated back-crossing to New World cottons it was found possible to transfer the red gene from Asiatic to U.4. A bulk collection of these Asiatic-U.4 hybrids was sent to the station for intensive examination and among their outstanding characteristics were early maturity, almost complete immunity from angular leaf spot, the presence in some cases of clean seeds and in many of them higher yield and lint of better quality and staple length than U.4. One plant matured in $3\frac{1}{4}$ months as compared with the normal six months taken by New World cottons. Selfed seeds of the best strains have been sent to India and Africa.

Asiatic characters are also being transferred to the big-bolled Upland type "Triumph" and the high yield of lint per boll and per seed of the latter have been combined with very early maturity.

Other work of economic importance is in progress, but has not progressed sufficiently to be reported on yet. Genetical work is in progress or has been completed on the relation between the different grades of corolla colour in Sea Island cotton and with other characters, the genetics of naked seed in Moco cotton (see above), the genetics of Kidney seeds, boll loculi and aborted ovules, a semi-sterile mutant in V. 135 and the production of commercial hybrids between cultivated cottons and wild types, such as *G. Trilobum* (*Thurberia*), *G. armourianum* and *G. aridum* (*Erioxylum*), which are almost always highly resistant to most cotton pests and diseases. Extensive data are given on many of the strains mentioned.

864. HUTCHINSON, J. B. and KUBERSINGH. 633.51:575.42
Studies in plant breeding technique. I. An analysis of the efficiency of selection methods used in the improvement of Malvi cotton.
 Indian J. Agric. Sci. 1936 : 6 : 672-83.

The object of the investigation was to determine whether two strains which had been isolated by selection and which were markedly superior to the local represented the maximum possible exploitation of the original material or whether there were genetic potentialities which might have been revealed by an improvement in breeding technique. Data from randomized, replicated progeny-row experiments on the selected strains are presented and it is concluded that the methods of selection adopted were not sufficiently sensitive to detect a large amount of genetic variance which was present in the material.

The superiority of the selected strains over the local is attributed to the breeder's judgment rather than to the selection methods. B. P. P.

SUGAR PLANTS 633.6

865. VENKATRAMAN, T. S. 633.61:575
Sugar cane varieties. Major factor in crop improvement.
 Agric. Live-Stk. India 1936 : 6 : 842-47.

This article, presumably intended for the general public, deals in simple terms with the origin of new sugar cane varieties from bud sports and seed; cane breeding; the naming of varieties and the importance of disease resistant canes.

Suggestions to growers conclude the article.

866. JANAKI AMMAL, E. K. and SINGH, T. S. N. 633.61:575.127.5:633.174
A preliminary note on a new *Saccharum* x *Sorghum* hybrid.
 Indian J. Agric. Sci. 1936 : 6 : 1105-06.

A form of *Saccharum spontaneum* from Dehra Dun with $2n = 56$ has been crossed with *Sorghum durra* ($2n = 20$) using the former as female parent. The hybrid is more like *S. spontaneum* than *Sorghum* but arrowed four months before the usual time of flowering in *Saccharum*. Root tip counts in the hybrid shewed that the number of chromosomes is thirty-eight, i.e. the sum of the haploid numbers of the Dehra Dun *S. spontaneum* and *Sorghum*. It is completely pollen-sterile. B. P. P.

867. McMARTIN, H. 633.61:575.252
 633.61:575.42(68)
Bud variation in sugar cane, and selection of cane for planting.
 S. Afr. Sug. J. 1936 : 20 : 685-87.

The difference between sexual and vegetative reproduction is explained with references to various bud sports affecting leaf or stem in the sugar cane. The necessity for testing such sports separately from the field sown variety in which they have arisen is urged as a way of ensuring that the field crop shall be as uniform as possible.

A collection of bud sports of sugar cane is being made at the Experiment Station at Mount Edgecombe, and other specimens with particulars of their origin, etc., will be welcomed.

868.

633.61:581.165

Sports in cane varieties.

S. Afr. Sug. J. 1936 : 20 : p. 619.

Indistinguishable "varieties" of sugar cane may, it is held, be regarded as probably having originated from a single clone.

Following the distribution of such a clone to different countries variation may occur, possibly as a result of climatic influence, and a particular varietal difference may be established throughout the crop of a particular country.

869.

KERR, H. W.

633.61.0014(94.3)

Some cane varietal trials harvested during 1936.

Cane Gr. Quart. Bull. 1936 : 4 : 40-45.

Among the varieties tested was a small number of the new Q series bred at Meringa Station. One of them, Q. 2, which appears promising for certain types of land in the northern area, is exceptionally free from trash and has a rather slender stalk. It appears worthy of further trial.

STIMULANTS 633.7

870.

633.71:575(68.9)

Tobacco research on the Trelawney station, 1935-1936 season.

Rhod. Agric. J. 1936 : 33 : 900-06.

In the breeding work on tobacco attention has been paid to the systematizing of the work of selection by measurements and by photographs of the mature plant and of a middle and a top leaf, taken with a scale. The yield and quality of cured leaf are also taken into consideration. Practically all the newly imported varieties were eliminated during the season.

871.

PAL, B. P. and NATH, P.

633.71:575.127.2:581.162.5

A note on the sterile hybrid between *Nicotiana Tabacum* L. and *N. plumbaginifolia* Viv.

Indian J. Agric. Sci. 1936 : 6 : 828-32.

A cross between *N. Tabacum* (♀) and *N. plumbaginifolia* (♂) gave a completely sterile vigorous hybrid which was intermediate between its parents in many ways. A number of characters not present in either of the parents, viz. streaking and striping of flowers, presence of accessory corolla lobes and complete sterility, appeared in the hybrid. The percentage nicotine content of the hybrid was 0.08 as compared with 1.07 of the *Tabacum* parent and 0.09 of the *plumbaginifolia* parent.

B. P. P.

872.

633.73.0015(67.62)

633.73-2-1.521.6

Coffee research. Sir Alan Pim's recommendations accepted. Formation of a coffee team.

Mon. Bull. Coffee Bd. Kenya 1936 : 2 : p. 205.

At the first meeting of the standing Joint Research Committee set up between the Department of Agriculture and the Coffee Board, held in October, 1936, a team of officers for coffee research was appointed to work under the Senior Plant Breeder. This article deals with questions relating to personnel and the maintenance and the establishment of a number of sub-stations in various districts in preference, at the present stage, to a central station for research. The selection and trial of promising types will hold an important place in the research programme—and especially with reference to the problem of disease resistance.

OIL PLANTS 633.85

873.

633.853.49:575(54.5)

634.58:575(54.5)

ALI MOHAMMAD, Ch.

Breeding investigations on oilseeds in the Punjab.

Seasonal Notes Punjab Agric. Dep. 1936 : 14 : No. 2 : 48-50.

The lines along which breeding work on oil crops has progressed are briefly indicated with

special mention of the difficulties due to self-incompatibility and of the necessity for hybridization. Self-fertile forms of Toria and brown Sarson have been obtained by crossing such forms with a yellow-seeded self-fertile type of Sarson.

Mustards, linseed and *Sesamum* have been improved by the isolation of purer types which are at present undergoing official trials. Hybridization is also being used to obtain better strains.

Two varieties of groundnut A_2 and B_1 are cited as high yielding with also an exceptionally high oil content.

FRUIT TREES 634

874. NEBEL, B. R. and RUTTLE, M. L. 634:581.162.32:578.08
634:581.331.2
Storage experiments with pollen of cultivated fruit trees.
J. Pomol. 1937 : 14 : 347-59.

Pollen of the apple, pear, plum, peach, cherry and grape was found to be capable of germination and of fertilization after storage for two years at 2° to 8° C. and 50 per cent humidity.

CITRUS FRUITS 634.3

875. 634.3:581.163
634.3:581.481
RICHARDS, A. V. 634.3-1.541.11:581.165
The propagation of citrus.
Trop. Agriculturist 1936 : 87 : 269-82.

The relative value of seedling and vegetative propagation is referred to and the use of clonal root stocks as one means of reducing the variability of *Citrus* scions is recommended.

Polyembryony and the possibility of deriving satisfactory nursery material from apogamic seedlings that have undergone rigorous selection are discussed.

SMALL BUSH FRUITS 634.7

876. LARTER, L. N. H. 634.771-2.484-1.521.6:575
The Highgate banana and Panama disease.
J. Jamaica Agric. Soc. 1936 : 40 : 528-29.

A comparative test of Highgate and Gros Michel raised in soil infected with *Fusarium oxysporum* shewed that as far as commercial value is concerned both varieties were almost equally susceptible to Panama disease. Highgate may possibly possess some slight degree of resistance or else may be slower in exhibiting the disease after infection.

VEGETABLES 635

877. VIJAYARAGHAVAN, C. and KESAVA IYENGAR, N. 635.25:581.162.31
Comparisons between the selfed and non-selfed onion flower heads and between the early and late flower heads arising from the same onion bulb.
Madras Agric. J. 1937 : 25 : 8-9.

Selfed flower heads gave a lower percentage of capsules formed than non-selfed and also lighter seeds, less seeds per head, a lower percentage germination and lighter bulbs. Comparing the early with the late flower head from the same bulb, the early had the advantage in number of flowers per head, weight of 500 seeds and percentage germination, but the late flower head set a slightly higher percentage of capsules.

878. ASHBY, E. 635.64:575.125:575.127.2
Studies in the inheritance of physiological characters III. Hybrid vigour from germination to the onset of flowering.
Ann. Bot., Lond. 1937 : 1 : (N.S.) : 11-41.

Three crosses were used in this investigation, two between two pairs of inbred strains of tomato and one between an inbred strain of *Solanum racemigerum* and an inbred strain of

tomato. In all three data on dry weights of samples were taken at intervals and in the first two data were also taken on height, number and length of internodes, number of leaves and leaf area.

In the first experiment and in the third, size heterosis appeared, as shewn by a significantly greater dry weight in the F_1 than in the parents. In the second experiment the hybrid was not significantly heavier than one parent. In this experiment the parent strains and the hybrid had approximately the same efficiency index or relative growth rate (Cf. Abst. 879 below), while in the other two the parent strains differed in relative growth rates and the hybrid was about the same as one of them. Heterosis is therefore due to the maintenance of an advantage present before the first sampling. Examination of the dry weights of embryos dissected out from the seeds shewed that in the hybrids shewing heterosis an advantage was already present here, but not in the hybrid which did not shew heterosis. Heterosis in the tomato therefore appears to be based on a similar mechanism to that postulated by the author for strains of maize, (Cf. "Plant Breeding Abstracts", Vol. I, Abst. 12, and Vol. III, Abst. 148) namely a greater "capital" rather than a higher "rate of interest". That this may be a matter of the number of primordial cells is indicated by the fact that cell size in the hybrid embryos was not greater than in the parents.

With height, leaf number, total leaf area and area per leaf similar conclusions were reached, that heterosis where it occurred represented the maintenance of an advantage present before the first sampling.

The rate of assimilation of the hybrids expressed as mg. CO_2 per dm^2 per day was not greater than that of the parents.

In the discussion criticisms of the author's earlier papers are answered (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 100) and data from other workers' results are given which indicate that the author's conception of heterosis in maize and tomatoes may have a more general application. An appendix gives details of the statistical treatment of the results, which employed the analysis of variance, local error being eliminated by the randomized blocks method.

879.

635.64:576.356.5-183:581.143

FABERGÉ, A. C.

635.64:575.125

The physiological consequences of polyploidy. I. Growth and size in the tomato. II. The effect of polyploidy on variability in the tomato.

J. Genet. 1936 : 33 : Pt. I, 365-82 ; Pt. II, 383-99.

In the first experiment reported four pure lines were used, P , a diploid, wild type and R , the corresponding autotetraploid obtained originally by somatic doubling, Q , a diploid carrying a number of recessive characters, including d (dwarf), and S , the corresponding tetraploid. The plants were grown in water culture in the greenhouse and the dry and fresh weights of roots and shoots were measured in samples taken every four days; as, however, it was found that the four lines did not differ significantly in water content and that dry weight of shoots was highly correlated with fresh weight of shoots and with dry weight of roots, dry weight of shoot was taken as representative of the plant as a whole. Logarithms to the base 10 of the weight were used so that the relation between weight and time should be approximately linear. The data were treated by the analysis of variance.

It was found that tetraploidy did not produce any significant difference in the amount of substance produced and that although differences in growth rate do exist, they are small and represent complex interactions with the genotype and the environment.

Data were obtained on the embryo and seed weights of the four lines and it was found that the tetraploid seed and embryos were about 30 per cent heavier than the corresponding diploids, the differences being highly significant; they disappeared, however, during germination.

In the second experiment ten lines were used, comprising diploid and tetraploid pure lines of different genotypes and diploid and tetraploid F_2 's from two different crosses. The seeds were sown in pots and were transferred outdoors during the course of the experiment, samples being taken at intervals of one week. Like the first experiment, this was laid out in the form of

randomized blocks, but whereas in the first case the sum of squares for blocks was not subtracted from error, owing to its insignificance, in this case it was subtracted and increased the precision of the experiment.

It was again found that the diploid-tetraploid comparison shewed no significant difference. The effect of heterosis was shewn by the F_2 —pure line comparison; heterosis did not differ significantly in diploids and tetraploids. Again the difference in growth between tetraploids and diploids (times \times lines interaction) was not due to a general difference in growth rate, but to different changes of the growth rate throughout the period. There was a significant difference between the growth rate of F_2 's and pure lines, the F_2 's growing more slowly; their greater weight must therefore be due only to increased initial weight (Cf. Abst. 878).

Other factors than those considered in the experiment led to considerable differences. In the second paper the data from the same two experiments are analysed to study variability. In both experiments the diploids were more variable than the tetraploids, the difference being of the type represented by displacement of the growth curves rather than by changes in slope, i.e., due to changes in W_0 in the growth equation

$$W_t = W_0 e^{rt}$$

where W_t = weight at time t , W_0 = initial weight and r = relative rate or efficiency index. The relative variability of growing populations was consistently in P , Q , R and S about three times that of embryos and the relative variability of tetraploid embryos was less than that of diploids. There was no consistent difference in skewness between diploid and tetraploid embryo populations. In the second experiment F_2 's were found to be more variable than pure lines.

An investigation on fruit weight similar to Lindstrom's (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 817) was undertaken, using a diploid and a tetraploid F_2 population. A reduction in variability and in fruit weight in the tetraploid, of the same magnitude as was reported by Lindstrom was observed, but the analysis of variance shewed the former to be due to a reduction in the variability within plants rather than between plants and therefore not due to genetic segregation. It is suggested therefore that the reduced variability of tetraploids is due to the doubling of the number of genes resulting in an increased probability of action of quantitative genes.

880. ASHBY, E. and LUCKWILL, L. C. 635.64:581.143.26:575.11
575.11-181
Inheritance of a differential growth-ratio.
Nature, Lond. 1937 : 139 : p. 71.

The relation between the sizes of two growing organs may be represented by the equation $y = bx^k$ where y is the size of one and x the size of the other organ, b is a constant and k is the differential growth-ratio. If α and β are the relative growth rates of the two organs, $k = \alpha/\beta$. In *Lycopersicum racemigerum*, *L. esculentum* var. Chinaman (a dwarf strain of the tomato) and their F_1 hybrid the following constant values for the differential growth-ratio between stem and leaf weights were obtained: 1.36, 1.06 and 1.30 respectively.

The differential growth ratio of the tall parent is therefore dominant.

881. RANGASWAMI AYYANGAR, G. N., KRISHNAN NAMBIAR, K. K. and KRISHNASWAMY, P. 635.654:575.113.4.061.6
Studies in *Dolichos lablab* (Roxb.) and (L.)—The Indian field and garden bean. III.
Proc. Indian Acad. Sci. 1936 : 4 : Sect. B : 411-33.

A detailed account of the inheritance and interactions of four factors K , P , Ch and I affecting pigmentation of plant and seed, the factor Bf (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 408) being left out of consideration. In addition to the effects already noted (loc. cit.), K with Ch produces a pink ridged standard and faint purple in the leaf axil and calyx; P produces pink in the wings and together with Ch produces a purple corolla, while with K and Ch it conditions purple leaf axils and flowers and black seeds. An intensifying factor I produces a purple wash in the internodes and purple pod sutures in the presence of K , P and Ch .

882. DIMMOCK, F. 635.655-2.19-1.521.6:575.42
Seed mottling in soybeans.
 Sci. Agric. 1936 : 17 : 42-49.

After a consideration of the findings of other investigators on mottling—a condition in which the testa in yellow and green seeded varieties of soybeans becomes splashed or blotched with irregular brown or black markings—the author's results with the variety O.A.C. No. 211, are analysed to shew that selection against mottling is not likely to be effective in a variety with such a relatively high degree of purity.

Certain abnormal plant types are described and an association between partially or completely suppressed pubescence and mottling was found as well as some data in support of Owen's theory that mottling in some cases may be due fundamentally to the accumulation of photo-synthetic products (especially sugars) as a result of continued synthesis after the seed has ripened.

Tests with twelve varieties and selections indicated that both environment and heredity are important factors in the production of mottling. One strain, "I selection", proved quite outstanding in the degree of resistance to mottling and single plant lines from the same strain were practically though not completely free from the defect.

Experiments with single plant lines derived from heterogeneous material shewed that lines with low susceptibility to mottling could probably be obtained by selection and theoretically completely resistant lines should also be within the range of possibility.

883. SANSOME, E. 635.656:576.356.2:575.116
Segmental interchange lines in *Pisum sativum*.
 Nature, Lond. 1937 : 139 : p. 113.

PELLEW, C.

Linkage in structural hybrids in *Pisum sativum*.
 Nature, Lond. 1937 : 139 : 113-14.

By studying the configurations produced at the first metaphase of meiosis in crosses between lines of spontaneous or natural origin shewing segmental interchange, seven structural types have been distinguished and their inter-relationships determined. Type 1 is the standard; type 7 has chromosome 1 interchanged with 2 and 3 and when crossed with type 6, which has chromosomes 1 and 4 interchanged, gives an association of eight chromosomes.

In plants of the standard type the genes *R* (*R-r* = round—wrinkled cotyledons) and *A* (*A-a* = coloured—white flowers) shew no clear linkage, but in plants with interchanges affecting chromosome 1 they shew linkage either with each other or with the gametic sterility by which the position of the translocation is indicated. This stronger linkage in structural hybrids is to be expected from the slight reduction in chiasma frequency observed in such hybrids.

884. SINGH, H. and 635.657:575.11:581.48
 EKBOTE, R. B. 635.657:575.11.061.6
The inheritance of seed-characters in gram (*Cicer arietinum* L.).
 Indian J. Agric. Sci. 1936 : 6 : 1087-1104.

The inheritance of a number of simple seed-characters is described in great detail. Yellowish brown and reddish brown seed colour are dominant to bluish brown on a simple monogenic basis. A cross between a variety with dark reddish brown seeds and another with bluish brown seeds segregated in F_2 in the ratio of 9 dark reddish : 3 yellowish brown : 4 bluish brown. Irregular shape shews simple dominance over round, and slightly granulated surface over smooth. The presence of black dots on the seedcoat is due to the cumulative effect of two factors each of which when present alone produces faint dots.

The association of these seed-characters with flower-colour is discussed.

B. P. P.

Part II. Foreign

STATISTICS 519

885. MA, P. C. and FAN, F. R. 519.2
(The meaning of probability and odds and the use of different probability tables).

Nung Pao, Nanking 1936 : 3 : 689-96.

The meaning of probability and odds is illustrated with simple examples. The use of Student's original z table and t table and Fisher's t table and their differences are discussed. How Love's, Livermore's (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 269) and Miles' tables of odds were derived from the above mentioned tables is pointed out. P. C. M.

886. BERKSON, J. 519.24
Significant figures in statistical constants.
 Science 1936 : 84 : p. 437.

RULON, P. J.
Significant figures in statistical constants.
 Science 1936 : 84 : 483-84.

MOULTON, F. R.
Significant figures in statistical constants.
 Science 1936 : 84 : 574-75.

While approving the rule for the number of significant places in a published statistical constant (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 488) Berkson points out that in certain cases, e.g. in the solution of simultaneous equations, it is necessary to maintain more places in computation than were advocated in the previous article by Roessler.

In Rulon's contribution to the discussion the original rule proposed by Dr. Roessler is amended by the insertion of the words "one third of" before "standard error".

Commenting on Berkson's letter, Moulton shews from theoretical considerations that the number of significant figures in the solutions of simultaneous equations may be less than those in the coefficients and that much of the extra computation mentioned by Berkson was superfluous.

887. PEARL, R. 519.24
Karl Pearson, 1857-1936. 575
 J. Amer. Statist. Ass. 1936 : 31 : 653-64.

An obituary notice in which the significance of Pearson's work in statistics and genetics is discussed.

888. SNEDECOR, G. W. 519.24
The improvement of statistical techniques in biology.
 J. Amer. Statist. Ass. 1936 : 31 : 690-701.

The author deals in an illustrative fashion with a number of recent improvements in statistical technique. In field experimentation the use of factorial design and the method of "confounding" are described, together with the further partitioning of degrees of freedom to examine a regression effect. Tests of significance in covariance analysis are commented on. Other problems dealt with are the calculation of correlation coefficients from consideration of the number of common elements present in both series, the application of the psychological factor theory in biology, and the enumeration of data by means of Pearson's "chi-square" test. J. W.

889. DUFRENOY, J. 519.24:632
Méthodes statistiques appliquées à la pathologie végétale. (**Statistical methods applicable to plant pathology**).

Ann. Épiphyt. Phytogénét. (1934/35) : 1936 : 1 : (N.S.) : 147-256.

The author gives a very complete account of the statistical methods likely to be useful in the reduction of experimental data of a genetical or other character, including field trials. The binomial and normal distributions are studied, and the use of a "goodness of fit" test for discrepancies between observation and theory is described. The methods of "Student" and Fisher for testing significance of means are copiously illustrated, and lastly the technique of "analysis of variance" is dealt with. Throughout the aim is to give a complete account of the particular method, to provide the necessary tables, which are reproduced from other sources, and to illustrate. There are many references to sources of method and material. J.W.

GENETICS 575

890. SCHÖN, A. and ORLT, R. 575:633(43:72)
Die Mährisch-schlesische Saatgut-Aktiengesellschaft in Hennersdorf.
(**The Moravian-Silesian Seed Company in Hennersdorf**).
Bl. PflBau. PflZücht. 1937 : 14 : 37-44.

The firm increases the seed of strains produced by other Moravian and Bohemian breeding stations, as well as breeding its own varieties. The aim in oat-breeding is the development of frost-resistant (for early sowing), mid-late strains, with a good yield of grain and straw of high quality—and in order that they may be suitable for growing on dry, flat lands—with no great water requirement and with resistance to rust and strong straw. In the breeding of fodder barleys, Egyptian and Abyssinian barleys of high protein content have been employed in crosses with native varieties rich in nitrogen. Breeding work is also carried out with potatoes, artichokes, flax, lucerne, birds-foot trefoil, sweet lupin, grasses and clovers. The system of selection used and the varieties the firm produces are described.

891. *KOL', A. 575:633(47)
63.00.15(47)
(**Reconstruction of plant industry in the U.S.S.R.**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : 10 : 87-107.

A diatribe against the work of N. I. Vavilov and the Institute of Plant Industry, in which on the basis of the original Darwinian theory and the theories of Michurin and of Lysenko, Vavilov is criticized for the very work which has gained him the admiration and confidence of scientists throughout the world. In making his criticisms the author ignores the main facts of modern genetical science, which is dismissed as "bourgeois and antiquated".

892. RUNGE, H. 575:633:061.3(43)
Arbeitstagung der Pflanzenzüchter in Goslar. (**Conference of plant breeders in Goslar**).
Obst- u. Gemüseb. 1936 : 82 : 170-72.

Various lectures were given upon the control of plant breeding, seed certification and preparation of statistics of recognized varieties.

893. NAUMOV, K. 575"793"
633.1:581.143.26:575
(**New problems in breeding for vegetation period**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 8 : 123-32.

Emphasis is laid on the importance of growing varieties that ripen in succession in order that the work of harvesting may be distributed as much as possible. Forms with a suitable range of times of maturity can often be produced by selection, since many lines of the common

* An extended summary of this paper is on file at the Bureau.

varieties are mixed in this respect; as well as by Lysenko's method of crossing forms differing in the length of the first two developmental stages. The same principle can be applied to producing hardy varieties for the north, since cold resistance is very much correlated with the first developmental stage.

A great advance in the direction of relieving the pressure at the beginning of harvest is afforded by the new perennial cereals produced by crossing with *Agropyrum*, perennial rye, etc., some of which in their second and later years mature much earlier than any other cereals, even winter rye, and can be harvested before the real pressure begins.

Attempts are now being made to use perennial barley (*Hordeum bulbosum*) and oats (*Avena pubescens*) in a similar way.

894. ŽEBRAK, A. 575.1

(Some modern questions on genetics).

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 8 : 97-122.

The distinction made both by Weissmann and Johannsen between germinal and somatic tissues and characters is criticized as being dualistic and not conformable therefore to modern dialectical standpoints. The chromosomal connexion between somatic and germinal cells is now indisputable. And it is shewn that age, temperature and other factors influence chromosomal phenomena such as crossing over, whilst the position of a gene in the chromosome is now known to affect its phenotypic expression. In fact this is in certain cases the only detectable difference between two distinct species.

Similarly dominance can be altered by age, conditions of temperature, nutrition, etc., and the dominance relations of a character may be quite changed in the course of evolution by the action of a particular set of environmental conditions. This shews moreover that both allelomorphs are present and active even in the case of complete dominance. In connexion with Lysenko's method of selecting in the first generation of a cross, it is pointed out that it is only for certain characters that it is possible to be sure that no forms with the character more pronounced than the F_1 will appear in the later generations. Moreover except in the case of vegetatively reproduced plants there is the risk of choosing individuals displaying heterosis in the F_1 and so losing vigour in the later generations. Similarly in relation to Lysenko's objection to pure lines (see "Plant Breeding Abstracts", Vol. VI, Abst. 765) it is pointed out that though inbreeding admittedly results in loss of vigour in many cases, instances are yet known when very valuable new forms or characters have been produced by its means and it is not possible to generalize as to the results or disadvantages of improverishing the genes of a strain, the results of which will naturally depend on the nature of the genes in question.

895. ŠLYKOV, G. 575.1:631.524

(Genetics and plant introduction).

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 9 : 99-112.

Many of the disciples of what is referred to as "formal genetics" are accused of dualism and an unscientific attitude in their use of the gene conception, which the author regards as a useful symbol for a not yet fully elucidated process consisting of the interaction of a complex mass of living material—but nothing more concrete. His view of the genetical phenomena, it is claimed, conforms also to Lysenko's genetical theories.

896. SEREBROVSKIJ, A. S. 575.114

Second variant of the M- σ^2 -triangle method.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1936 : IV (XIII) : 21-24.

The triangle previously referred to (see "Plant Breeding Abstracts", Vol. VII, Abst. 97) can be extended in its use to sibs from a cross, different combinations of sibs giving offspring occupying characteristic positions on the triangle; the triangles obtained from mixed crossing within all these sibs are given for one pair of factors and for 2, 3, etc. pairs, and are seen to be more reliable than the triangle from the original cross in determining the number of characters.

897. *LYSENKO, T. D. 575.12
(Intravarietal crossing of self-pollinated plants).
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : 10 : 70-86.

The author believes that continued self-fertilization leads to degeneration and that this, like sterility and other deficiencies encountered in inbreeding, is not due to the segregation of genes—for the gene concept is a fallacy and a hindrance to practical work—but rather to a too great similarity of the gametes. Diversity of the gametes can be caused by diversity of the environment of the plants producing them and so by crossing different plants in a variety the original vigour is restored. By this method improved varieties can be produced from old ones in a much shorter time than is required by more orthodox methods.

In laying down a theoretical basis for his method the author breaks away from the theories of classical genetics and emphasizes the importance of a plant's environment on the gametes it produces.

898. BRINK, R. A. 575.125:633.311
The physiological basis of heterosis.
 Science 1937 : 85 : p. 58. (Abst.).

Embryos produced by cross-fertilization in *Medicago sativa* shewed a much lower incidence of abortion than did those produced by self-pollination. It is possible that this is due to a shift in the balance of the growth-regulating mechanism in favour of the embryo when the latter is hybrid in origin and that heterosis in general may rest on a physiological basis of this sort.

899. *HABERLANDT, G. 575.127.2:581.49:576.356.5
 Zur Physiologie und Pathologie der Spaltöffnungen. II. Mitteilung. Die Spaltöffnungen von Artbastarden. **(The physiology and pathology of stomata. 2nd communication. The stomata of species hybrids).**
 S.B. preuss. Akad. Wiss. phys.-math. Kl. 1934 : 10 : 115-51.

Observations were made on the stomatal structure of 45 F_1 species hybrids and their parents in the genera *Salix*, *Populus*, *Berberis*, *Saxifraga*, *Ribes*, *Sorbus*, *Aesculus*, *Primula*, *Nicotiana*, *Antirrhinum*, *Digitalis* and *Senecio*. Of these 21 displayed irregularities, very marked in 7, somewhat less so in 14. The first degree of abnormality consists in an alteration of the form of the cells resulting from a disturbance of the relations between the length and breadth. Next comes an inequality in size of the two guard cells, resulting evidently from the stimulating action of the metabolic products resulting from a disharmonic combination of plasma—the simplest case of heterosis. Next comes an arched or even wavy form of the outer cell wall of the guard cell, bringing it gradually to the form of an epidermal cell; loss of chlorophyll often occurs too. Interrupted development, such as absence of slit, then failure of the mother cell to divide, are the next stages of the disturbance phenomena; in the more extreme cases the chlorophyll is also absent. Next comes the premature death and degeneration of one or both of the guard cells. The different expression of these phenomena in different cells is ascribed to the different sensitivity of the cells.

The stomatal cells are sometimes intermediate in size between the parents, in other cases the maternal parent is dominant, or they may be below or above the average of the two parents. This is ascribed to heterosis, which also explains the occurrence of twin stomata. In the three amphidiploid hybrids studied, *Aesculus carnea* (*hippocastanum* x *pavia*), *Primula kewensis* (*verticillata* x *floribunda*) and *Nicotiana Tabacum* var. *petiolaris* x *N. Rusbyi* the stomata were considerably larger than in the parents.

The degree of abnormality in F_1 hybrids is not invariably parallel to the sterility of the hybrids, which is not remarkable in consideration of the much greater variety of causes of sterility than of abnormal stomata.

Similar anomalies have been observed by the author in graft hybrids.

Such stomatal anomalies are more frequently found in cultivated plant species than in wild ones, which may be an indication that a great number of cultivated plant species owe their origin to hybridization.

* Extended summaries of these papers are on file at the Bureau.

900. JAKUBTSINER, M. M. 575.148
(New data on pure lines).
 Selekttsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 :
 36-37.

A brief review of modern ideas and theories on the subject, as reflected in the recent literature on genetics from countries other than Russia.

901. JENNINGS, H. S. 575.17
Fundamental units in biology.
 Science 1936 : 84 : 445-50.

A simple account of the behaviour of genes leading to a discussion of their physical nature in which the view that they may not be individual particles but merely differentiated regions in the chromosome (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 452) is briefly outlined.

902. MARKIN, V. and MIKHAILOVSKII, V. 575.19
 575.42
(Methods of producing super-élite forms at the Tulun Experiment Station).
 Selekttsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 :
 64-65.

The importance of purity of the initial material used in the production of varieties and of maintaining the purity of pedigree varieties is emphasized as an introduction to a description of the method used at the Tulun Station and now recommended as a way of reforming the haphazard method at present in use at many Russian Experiment Stations where selection is made by mass selection on the basis of the phenotype alone. A study of the actual growth and development of the variety of the individual plant is essential if the exclusion of all off-types due to mutation or other internal or environmental factors is to be ensured.

903. GATES, R. R. 575.24:575.41
Mutations and natural selection.
 Amer. Nat. 1936 : 70 : 505-16.

In this survey numerous instances are given of mutant forms which have been able to establish themselves apparently without the aid of natural selection. The widespread occurrence of parallel mutations is emphasized and it is pointed out that here again in many cases natural selection has played no part.

904. NAWASCHIN, M. and 575.24:581.01
 GERASSIMOWA, H. 576.356.2:581.01
 Natur und Ursachen der Mutationen. III. Über die Chromosomenmutationen, die in den Zellen von ruhenden Pflanzenkeimen bei deren Altern auftreten. **(Nature and causes of mutation. III. On the chromosome mutations which appear in the cells of resting plant embryos on their aging).**
 Cytologia, Tokyo 1936 : 7 : 437-65.

A further theoretical discussion of the data already reported (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1151).

Reasons are given to justify the conclusion that the phenomenon is not due to selective elimination of non-mutated individuals or to the effect of natural radiations, but rather to the physiological conditions in the cells of aging embryos, a conclusion which is supported by the occurrence in other organisms of genes causing frequent mutations and by the acceleration of the process which can be produced by subjecting the aging seeds to higher temperature or humidity. Although the mutations can only be seen when the affected cells divide, they probably occur in the resting stage. The fact that they consist exclusively of dislocations shews that the process of nuclear division plays no part in their origin. In the embryos the mutations are of many different types and distributed at random in the different tissues. In the later

development the number of types in a given individual is reduced by elimination of the less viable ones to very few, giving a simple sectorial chimera, which shews that the agency producing them ceases to work when the embryo emerges from its dormant condition. The random distribution of the mutations has the consequences that the underground part may have a quite different constitution from the aerial parts and also that the reproductive organs may be affected, giving rise to mutant progeny in the next generation.

The proportion of mutant individuals obtained from aged seed depends in the first place on the age of the seed, but other factors can complicate the issue. The influence of temperature and humidity has already been mentioned. Experiments are now in progress with carefully controlled external conditions, the results from which are to be expected in 1939-40. Another factor is the death of many mutant seedlings when the mutation rate is high.

Translocations occur at random between any two chromosomes, homologous or non-homologous and at random along their length. Where it could be tested, the hypothesis that translocations are always reciprocal was confirmed (in four cases involving the satellite chromosome). Inversions also occur. Any dislocation which results in a noticeable loss of chromosome material apparently causes the ultimate death of the nucleus. No alteration in the number of spindle fibre attachment bodies (centromeres) was observed and they are apparently capable neither of arising *de novo* nor of being resorbed. Two cases which might, however, be considered as preliminary stages in the change of the basic number by dislocation were observed. The first shewed that breakage of a chromosome arm might occur very near to the centromere; if this happened on both sides of the centromere and both arms were translocated to other chromosomes, the centromere could be lost without the viability of the nucleus being affected and hence the chromosome number might be reduced. The second case occurred in a trisomic; here both the arms of the supernumerary chromosome were broken off near the centromere. If this were followed by translocation of a fragment from another chromosome to the centromere the conditions would be fulfilled for a stable complement to arise with the basic number increased by one.

Other aspects discussed are the evolutionary, ecological and agricultural significance of the process and the conception of mutation as a stage in development (Cf. "Plant Breeding Abstracts", *loc. cit.*).

905. BRINK, R. A. 575.243:576.356.5:578.08
A portable chamber for treating plants with heat.
 J. Amer. Soc. Agron. 1936 : 28 : 1021-22.

A description of a bottle with an electrically heated water jacket, used for inducing polyploidy.

906. ZIRKLE, C. 575.31:575.4
Further notes on pangenesis and the inheritance of acquired characters.
 Amer. Nat. 1936 : 70 : 529-46.

Further extracts from early writers shewing the prevalence of the belief in pangenesis and the inheritance of acquired characters (Cf. also "Plant Breeding Abstracts", Vol. VI, Abst. 448).

907. MCATEE, W. L. 575.4
The rôle of fitness in evolution.
 Ohio J. Sci. 1936 : 36 : 237-41.

MCATEE, W. L.
The postulated resemblance of natural to artificial selection.
 Ohio J. Sci. 1936 : 36 : 242-52.

In the first of these two articles the conclusion is reached that fitness must be individually acquired and is not inherited; in the second the author seeks to shew that natural selection is quite different from artificial selection.

908.

LAZAREV, N. V.

575.42

635.64:575.113.42:581.47

(A possible basis of selecting parents for crossing).

Selektsiya i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 32-33.

As a basis for research on hybridization the possibilities of applying vernalization to all the main crops and also the principles of the selection of suitable pairs of types in breeding for different characters should be studied.

As a result of experience the author suggests that certain genotypes possessing a particular character in an "intense degree" will shew a high percentage of transmission of the character to their progeny. Parent plants should be chosen exhibiting the desired character very markedly.

In order to identify those forms likely to transmit a certain character with a high degree of certainty, it is suggested that large numbers of combinations and a relatively small number of F_2 plants should be used in preference to fewer combinations and a large F_2 . Satisfactory results in testing combinations have been obtained with 200 F_2 plants. The plants exhibiting a high degree of the desired character could be identified in the F_2 .

CYTOLOGY 576.3

909.

MARSHAK, A.

576.312.38:635

The structure of somatic chromosomes.

J. Hered. 1936 : 27 : 459-63.

According to the author's observations on *Allium*, *Lactuca*, *Papaver*, *Pisum* and *Vicia* anaphase and prophase chromosomes consist of a pair of chromonemata, each coiled in a minor spiral and also coiled around each other in major spirals whose direction is opposite to that of the minor spirals. The metaphase chromosome contains four such chromonemata.

910.

SAX, K.

576.356.5:581.9:634.1

Polyploidy and geographical distribution in *Spiraea*.

J. Arnold Arbor. 1936 : 17 : 352-56.

The American species of *Spiraea*, which are on the periphery of the area of distribution of the genus, are tetraploid or hexaploid while the Old World species, in the centre, tend to be diploid. The same relationship has been shewn in *Malus*.

EXPERIMENTAL TECHNIQUE 578.08

911.

IVANOV, N. N.

578.081:581.192:581.48

(Microchemical analysis of seeds without loss of germinative power).

Priroda (Nature) 1936 : No. 8 : 76-83.

By the microchemical methods of analysis elaborated at the Institute of Plant Industry, Leningrad, the chemical composition of a single seed can now be determined, in many cases without injuring its germinating capacity. It has in consequence of this been possible to analyse over 1,000 lupin seeds per day, facilitating the production of alkaloid-free strains, (see "Plant Breeding Abstracts", Vol. III, Abst. 437), of which hundreds of hectares are now being grown; it is anticipated that by similar methods lines with high protein content will be produced.

Equally successful results have been obtained in the determination in single seeds of the oil content (see "Plant Breeding Abstracts", Vol. VI, Abst. 230) and the protein content (see "Plant Breeding Abstracts", Vol. VII, Abst. 366).

These methods have made it possible to study the variation in chemical composition within a morphologically pure line and to elucidate the genetics of chemical characters, so enabling the breeder to bring about material increases in the content of desirable compounds and reductions in the undesirable. The methods are particularly valuable in that they allow of the discovery of differences between individual seeds which may be the result of mutation and which by cruder methods would be overlooked and lost.

FIELD TESTS 631.421

912. PRZYBOROWSKI, J. and RUEBENBAUER, T. 631.421:633.11-1.557
Doświadczenia z odmianami pszenicy ozimej przeprowadzone w latach 1926-1934. (Varietal tests of winter wheat, carried out from 1926 to 1934 in south west Poland).
Wydaw. Sekcji Nasiennej Przy M.T.R. w Krakowie z Udziałem Zakładu Hodowli Roślin i Doświadczalnictwa U.J. Kraków 1936 : No. 13 : Pp. 56.

In Section IV which stresses the importance of recognizing the reaction between a particular genetic constitution and its environment, it is shown that the relative performance of a number of varieties may differ in a series of trials owing to the influence of climate, nutrition, etc. This view is further brought out by a study of the regression of the grain yields on the thousand corn weight for individual varieties in different years.

Research on the various effects of altered conditions upon the yield should be begun and should include in addition to the usual field tests also pot tests and even field tests into which certain differences in the environmental factors should be intentionally introduced.

913. CURRENCE, T. M. and KRANTZ, F. A. 631.421:633.491
The relation of plot size and shape to potato yield variations.
Amer. Potato J. 1936 : 13 : 310-13.

A uniformity trial comprising 42 rows, three feet apart and eighteen rods long, was harvested in one-rod sections and the data were analysed by the randomized blocks method, taking plots 1, 2, 3, 6, 9 and 18 rods long and 1, 2, 3 and 6 rows wide. The standard deviation of a single plot as a percentage of the mean of all plots, the approximate number of replications needed to give a standard error of difference between two means of 5 per cent and the area in acres required by each variety to give such an error are given in tabular form.

With one-rod single row plots 29 replications, covering .0329 acre, would be needed for the standard of accuracy indicated, with two-rod single row plots 17 replications covering .0387 acre.

914. HANCOCK, N. I. 631.421:633.51
Row competition and its relation to cotton varieties of unlike plant growth.
J. Amer. Soc. Agron. 1936 : 28 : 948-57.

Row competition was induced in a study of California Acala and Delfos 6102 by means of an experiment in which different combinations occurred of single row plots of the two varieties. Thus, for example, a comparison of Acala grown in three adjacent rows with a single row of Acala bordered by two rows of Delfos was possible. The trials were carried out for four years. The principal result was an effect from unequal plant growth in the Acala combinations. It is suggested that two-row plots be used for cotton varietal trials on medium fertile soil. J.W.

915. NUCKOLS, S. B. 631.421:633.63
The use of actual and competitive yield data from sugar beet experiments.
J. Amer. Soc. Agron. 1936 : 28 : 924-34.

A method of compensating for inequalities in stand in sugar beet experiments is to base the yield only on those beets which are surrounded on all sides by other beets, the so-called "competitive" beets. The author shews that when the competitive yield thus obtained and the actual yield are plotted against per cent stand the actual yield decreases, as would be expected, but the competitive yield increases, indicating that the compensation for stand is disproportionately greater when the stand is poorer. There is also indication that the difference between the competitive and actual yields is greater when closer spacing is used.

PLANT DISEASES 632

916. STAKMAN, E. C. 632.4:576.16
The problem of specialization and variation in phytopathogenic fungi.
 Genetica 1936 : 18 : 372-89.

A general survey, covering the economic importance of the problem, its significance in the breeding of resistant varieties and the origin of new forms by hybridization and mutation.

917. SCHMIDT, M. 632.42:576.16:634.11
Venturia inaequalis (Cooke) Aderhold. V. Weitere Untersuchungen über die auf verschiedenen Bäumen lebenden Populationen des Apfelschorfpilzes. (*V. inaequalis* (Cooke) Aderhold. V. Further investigations on the apple scab populations living on different apple trees).
 Gartenbauwiss. 1936 : 10 : 422-27.

SCHMIDT, M.
Venturia inaequalis (Cooke) Aderhold. VI. Zur Frage nach dem Vorkommen physiologisch spezialisierter Rassen beim Erreger des Apfelschorfes. Erste Mitteilung.
 (*V. inaequalis* (Cooke) Aderhold. VI. The question of the occurrence of physiologically specialized races in the apple scab pathogen. First communication).
 Gartenbauwiss. 1936 : 10 : 478-99.

Marked differences were observed between cultures of different origin both as regards morphological features and pathogenicity. Similar differences were observed between different single spore cultures from the same tree or even the same leaf; e.g. 35 different types were isolated from 100 cultures from eighteen leaves of Boskoop Belle. Many of these shewed pathogenic differences with respect to other varieties. Many wild species were attacked by some of these cultures, *Malus spectabilis* having so far remained uninfected. The varieties Ernst Bosch and Antonovka, though resistant to most forms, were attacked by some.

918. HERBST, W. 632.42:576.16:634.11:575.242
Venturia pirina Aderhold. I. Zur Formenmannigfaltigkeit des Pilzes. (*V. pirina* Aderhold. I. Existence of a number of forms of the fungus).
 Gartenbauwiss. 1936 : 10 : 428-50.

Single spore cultures numbering over 1,300, from 40 different pear varieties, were studied in detail and are described. Marked morphological differences were observed between different forms, occasionally more than one form being found in the same infected area; this occurred, however, in only 14.4 per cent of cases.

Variants were also observed in the cultures, with a frequency of 16.7 per cent. The variant forms retained their characteristics under further culture and are regarded as true mutations, the occurrence of which in nature has probably contributed to the great diversity of the fungus. Some mutant types were more frequent than others. Reverse mutations were also observed.

919. STAKMAN, E. C. 632.451.2:576.16:575.12:575.242
Variation in *Ustilago zeae*.
 Science 1937 : 85 : 58-59. (Abst.).

Lines of *U. zeae* resulting from a single unicellular, unisexual individual can be maintained by vegetative propagation on culture media. Hundreds of new lines have been obtained by hybridization and by mutation, differing in cultural characters, sex, parasitism and also in their tendency to mutate. The latter is itself a heritable character and its inheritance can be studied in crosses between mutable and constant lines.

920. MURPHY, H. C. and LEVINE, M. N. 632.452:576.16:633.13
A race of crown rust to which the Victoria oat variety is susceptible.
 Phytopathology 1936 : 26 : 1087-89. (Abst.).

A new race of *Puccinia coronata*, to be called race 41, has been discovered which will infect the oat variety Victoria (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1239). The variety Bond is however completely resistant to it and it is pointed out that for every known parasitic race of rusts or smuts affecting oats, an oat variety completely resistant is known.

921. PAINTER, R. H. 632.7-1.521.6:581.192
The food of insects and its relation to the resistance of plants to insect attack.
 Amer. Nat. 1936 : 70 : 547-66.

A survey of the different factors which may confer resistance to insect attack on a plant, with reference to the possibility of breeding for resistance. Emphasis is placed on the food value of the plant for the insect and numerous instances are quoted of varieties within a species differing in this respect. The difference is visible chiefly in its effect on length of life, death rate, size and fecundity of the pest.

922. GRATIA, A. and MANIL, P. 632.8:575.1:633.491
 Virus des plantes et hérédité. (Plant viruses and heredity).
 C.R. Soc. Biol. 1936 : 122 : 814-15.

In potatoes infected by the X virus the sap of the plant and of the cells of the pericarp is flocculated by the injection of anti-X serum; the sap from the cells of the seed is, however, not affected. The same is true of the so-called "carrier" varieties and proves the non-heredity of the virus.

ECONOMIC PLANTS 633

923. 633:576.312:575.1(92)
 633.18:576.312.35
 633.73:576.312.35
 633.513:576.312.35
 HEYN, A. N. J.

Cytologische onderzoekingen aan enkele tropische cultuurgewassen en de betekenis van dergelijke onderzoekingen voor de plantenveredeling.
 (Cytological investigations of some tropical cultivated plants and the importance of such investigations for plant breeding).
 Landbouw 1936 : 12 : 11-42.

In demonstrating the importance of cytological investigation in plant breeding the main facts so far ascertained by cytological research on various plants are considered under the following aspects, relevant literature being cited: the role of the chromosomes in the differentiation of varieties, in phylogeny and in hybridization; experimentally induced polyploidy, translocation and fragmentation.

The author has determined the chromosome number in root-tips of varieties and hybrids of coffee and found in *C. liberica* 44 chromosomes and in *C. excelsa*, *C. abeocuta*, *C. canephora*, *C. robusta* and *C. congensis* 22 chromosomes, while Kawisari hybrids shewed 44 and 33. The bearing of the results on the possibility of producing fertile hybrids from which desirable segregates may be obtained in the F_2 is indicated.

The chromosome numbers in the root tips of a large number of rice varieties and hybrids from various countries and one mutant form were determined and proved in all cases to be 24. Slight differences in chromosome arrangement at metaphase and in size were observed and possible interpretations of these differences are suggested.

Cytological examination of the root tips of a number of varieties of kapok *Ceiba pentandra*, shewed that the Suriname and Congo varieties belonging to the *caribaea* type had the highest chromosome number, namely 88, whilst the *indica* types Saigon, Bondowoso and Kelet appeared to have each 72 chromosomes and the varieties Boeboelak and Lanang shewed intermediate numbers between 88 and 72. The discovery of this polyploid condition, which

is not thought to be of long standing in kapok, should throw light upon various instances of apparently anomalous segregation in crosses and upon the possibility of obtaining constant hybrids in the F_1 generation.

A four page bibliography is appended.

924. SENGBUSCH, R. v. and ZIMMERMANN, K. 633:578.088.2
Eine Einzelpflanzendreschmaschine. (**An individual plant threshing machine**).
Züchter 1936 : 8 : 301-04.

A machine that threshes both cereals and leguminous plants, that does not reduce the germination capacity of the seed, that is simple to use and not costly has been constructed for the Kaiser Wilhelm Institute by the firm Sellin and Co., Müncheberg. The machine, which is described in detail, should be of interest to plant breeders.

925. GESELE, E. E. 633-2-1.521.6:575:578.08
(**The method of automatic discarding of breeding material of genotypes susceptible to disease**).
Selektcija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 : 38-42.

The author points out how so often the resistance of a variety to a particular pest is proportional to the occurrence of the latter in the region of origin of the variety, and how two or more characters frequently appear together in nature, though genetically they can be shewn to be entirely unassociated. These are all results of natural selection in the past. Similarly the old varieties underwent a process of natural selection for suitability to a low level of agriculture. This must now be corrected by artificial selection. Similarly varieties resistant to any given disease can often be produced by growing under conditions of heavy infection and selecting the survivors. In this way it has been possible to produce sunflowers resistant to *Orobanche*, potatoes resistant to blight from among the hybrids of domestic potato with *S. Antipoviczii* and *S. demissum*, and phylloxera resistant vines and many other valuable resistant plants, including Hope wheat.

CEREALS 633.1

926. TSCHERMAK-SEYSENEGG, E. 633.1:575
Über die Bedeutung züchterischer Massnahmen zur Hebung des Getreidebaues, ungeachtet der Überproduktion. (**On the importance of breeding measures for the increase of cereal cultivation, over-production notwithstanding**).
Wien. landw. Ztg. 1936 : 86 : 287-88.

Yield and quality are the main breeding aims in our bread cereals. As far as quality is concerned our land varieties are superior to the breeding varieties of the West; but this superiority does not hold for yield, resistance to lodging, etc., and therefore combined breeding must be undertaken. Besides cross-breeding, improvement by selection must be taken into consideration. In rye, wheat and barley we, in Austria, possess sufficient breeding material of high quality so that there is no need for importation; but this is not so in oats. For the continental climate a combination of early ripeness and high yield is especially important. Besides hybridization, crossing to obtain transgressive forms plays a considerable part, e.g. in winter-hardiness and gluten characters. Mutation and the chromosomes must also be taken into consideration in breeding. Besides purely breeding methods for increasing yield and quality the compulsory limitation of the number of varieties has been suggested on many sides. The author is in favour of the proposals if extensive researches give unequivocal results. The establishment of variety maps appears to the author to be of great importance. Finally, the value of an International Exchange of the plants obtained by segregation is referred to.

A.B.

927. RIEBESEL, G. 633.1:575.12:631.532.3
 Vegetative Vermehrung von Getreide-Bastarden. (**Vegetative propaga-
 tion of cereal hybrids**).
 Züchter 1937 : 9 : p. 24.

A method is described by which sterile or partially sterile cereal hybrids can be grown to give the maximum material for vegetative reproduction.

928. PRAT, H. 633.1:582:576.16:585.421
 La systématique des Graminées. (**The systematic classification of the
 Graminae**).
 Ann. Sci. Nat. 1936 : X.Ser.Bot. 18 : 165-258.

An examination of existing systems of classification with suggestions for the study of "types of organization" of the various forms as the most suitable basis of future classification and research on the subject. In the preliminary work of identifying the types and relationships among the thousands of existing species all branches of plant science including genetics and serology should co-operate.

A bibliography is appended.

929. 633.1-2.111-1.521.6:578.081
 IVANOV, P. K. 633.1-2.112-1.521.6 : 578.081
 (**On the diagnostics of frost- and heat-resistance of plants by their
 seeds**).
 Bull. Acad. Sci. U.R.S.S. Ser. Biol. 1936 : No. 1 : 89-110.

The method of selecting for frost resistance here described consists in soaking the seeds in water at 15-16° C. for four hours and immediately subjecting them to frost. The results led the author to conclude that the germination percentage obtained after such treatment corresponded closely to the frost resistance and also the drought resistance of the variety tested. Similar experiments were made with high temperatures, the swollen seeds being subjected for 30 minutes to temperatures of 45, 47 and 49° C. The heat resistance of the wheat varieties was in the same order as their frost and drought resistance, though other crops such as rye and millet shewed different behaviour as regards cold and heat resistance. The heat resistance of the seeds, in general, corresponded with the drought resistance of the plants.

930. 633.1-2.4-1.521.6:615.37
 VITENSON, D. 635.64-2.8-1.521.6:615.37
 (**Serological methods in the phytopathological estimation of seeds**).
 Plant Protection, Leningrad 1936 : No. 9 : 38-48.

The possibility of determining varietal susceptibility to disease by serological tests of the protein of the seed is incidentally mentioned.

931. SPRAGUE, R. 633.1-2.484-1.521.6:575.127
 Relative susceptibility of certain species of *Gramineae* to
Cercospora herpotrichoides.
 J. Agric. Res. 1936 : 53 : 659-70.

The author suggests that cereals resistant to *Cercospora* foot rot may eventually be bred from crosses between wheat and certain related wild grasses.

WHEAT 633.11

932. FONDARD, L., 633.11:537.5
 GERMAN, E. and
 CABASSON, F.
 Électrogénétique. Fécondation croisée, rayons X, ondes courtes et muta-
 tions. (**Electro-genetics. Cross pollination, X-rays, short waves
 and mutations**).
 Rev. Hort. Paris 1936 : 108 : 369-71.

The wheat variety Tuzelle appears to be very homogeneous and is not easily cross-pollinated. Cross-pollination, however, was tried continuously from 1926 until in 1933 some grains gave plants shewing segregation. In 1933 X-rays and short wave treatment was applied to the pollen. Many of the resultant plants shewed variations unknown in the parent variety.

933. 633.11:575(47)

(A new variety of wheat).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 : p. 88.

This new winter wheat, DC. 2444 2, bred at Detskoe Selo Experiment Station gave a yield of 32.8 centners per ha. and displayed good winter-hardiness, seed quality and resistance to lodging.

934. 633.11:575(47)
633.11 Zarja

(A new variety of wheat).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 : p. 88.

"Zarja", the new winter variety, yielded 40-42 centners per ha. on an average, in some instances 50 centners per ha. and on other plots 30 centners.

935. 633.11:575(47)
575:633(47)

MAL'TSEV, T.

(My work in the production of new varieties).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 49-51.

The most suitable type of wheat for the Čeljabinsk district is discussed as a preliminary to an account of the beginning of variety trials by the author in 1921. Co-operation with various institutes led to investigations on the problem of perennial wheat and to work on wild crop plants including *Aegropyrum* and the application of Lysenko's methods is contemplated. Fifty field laboratories are co-operating in the attempt to produce high yielding varieties that are hardy and suitable for mechanical harvesting.

The author's method of work is described and investigations on various crops are stated to be in progress on the production of varieties with drought resistance and other good qualities.

936. 633.11:575(47)
633.13:575(47)

TIMČENKO, I. A.

(New varieties of winter wheat and oats).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 54-56.

The performance of certain varieties of wheat produced since 1921 is recorded including Ukrainka and Zarja and more recent selections such as Nos. 23 k c 201 *Zarja* and No. 27/24 F 84 3, both of which show good yielding capacity and smut resistance. It is stated that No. 23 k c 201 is resistant to lodging and No. 27/24 F 84 3 to rust. Good baking quality is also claimed for the latter.

Similar information is given on the production of varieties of oats, in which special attention is paid to rust resistance as well as yield, earliness, resistance to shedding and lodging. Nos. 26-1363 and 26-1655 which are populations selected from local varieties appear to be outstanding among the new varieties with good economic qualities.

937. 633.11:575(51)
633.11 Kaifeng 124

PEH, C. K.

(Kaifeng 124, a new wheat variety for northern China : its breeding and extension).

Nung Pao, Nanking 1936 : 3 : 1605-22.

A brief history of the new wheat variety, Kaifeng 124, developed by the Nanking University Kaifeng Station, Honan, is given. The wheat is noted for its adaptability to alkaline soil, resistance to prevalent diseases, stiff straw, grains not easily shattered, higher yield and high flour content. When grown on demonstration farms near Kaifeng it out-yielded the best local varieties by 5 to 33.9 per cent, while the weight per bushel was also higher. Its flour content ranges from 72.26 to 73.55 per cent. Methods of distribution and seed certification are outlined in detail.

P. C. M.

938. SHEN, T. H. 633.11:575(51)
(A co-ordinated program of wheat breeding in China).
 Misc. Publ. Nat. Agric. Res. Bur. Nanking 1936 : No. 6 : Pp. 30.

SHEN, T. H.
(A co-ordinated plan of wheat breeding for China).
 Nung Pao, Nanking 1936 : 3 : 1299-1308.

Full details are given of a suggested plan for co-ordinating wheat breeding in China, based on the experience which has already been gained. The plan includes regional trials in the seven wheat producing regions which have been differentiated as a result of previous studies and nursery trials for the study of disease resistance (rusts, smuts, scab and nematodes) growth habit and winter-hardiness.

The methods of breeding advocated are head selection from local varieties and hybridization, including crosses with imported wheats, of which a large collection has been made by the National Rice and Wheat Improvement Institute.

Suggestions are also given for demonstration trials and for annual meetings of the workers in each region.

939. QUISENBERRY, K. S. 633.11:575(73)
Developing and testing improved varieties of wheat.
 Cereal Chem. 1936 : 13 : 712-18.

After a brief mention of the three chief methods of obtaining new varieties, introduction, selection and hybridization, an outline is given of the method of co-ordinating wheat breeding in the hard red winter wheat region of the U.S.A. Breeders and pathologists are located in the different States of the region and baking laboratories are available at different points. The behaviour of strains with respect to adverse factors is studied at those places where the respective factors are particularly prevalent.

When a strain has shown promise in early generations at one station it is grown and observed in uniform nurseries at about twelve stations. The better strains from the nursery are tested in uniform field trials at the various stations for three to five or more years, until ultimately the best variety is ready for testing on farms. Much attention is paid to quality, though a widely acceptable quality test applicable to small amounts of seed is still needed.

940. 633.11:575(79.4)
 633.11 Ramona
 633.11:575(79.2)
 633.11 Erect

CLARK, J. A.
Registration of improved wheat varieties, X.
 J. Amer. Soc. Agron. 1936 : 28 : 1017-18.

Brief accounts are given of the wheat varieties Ramona, bred in California from a cross between Hard Federation and Bunyip and Erect, bred in Utah from a cross between Dicklow and Hard Federation.

941. 633.11:575(81)
 633.11 Eureka

Trigo variedad "Eureka." **(The wheat variety "Eureka").**
 Bol. Chacra Exp. "La Previsión" 1936 : 2 : p. 109.

The new variety, obtained from a cross between Barleta and Ruso crossed to Kanred, is a mid-early, semi-spring type, very resistant to frost, and to *Puccinia glumarum* and apparently also *Ustilago tritici*, gives yields equal to the local standard variety and is of excellent quality.

942. NAVOLOTSKIĖ, A. V. and NAVOLOTSKAJA, N. M. 633.11:575:581.142
(Breeding spring wheat to raise the germination capacity of the grain).
 Seleksijsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 :
 25-32.

The effects of excessive moisture due to a damp climate upon the seed quality and germination capacity of wheat seed is demonstrated by numerous instances of defective seed and germination

in the ear resulting from bad conditions during harvest. The question of the resistance of the plant itself to such unfavourable environment is also examined and the possibility of breeding to increase the germination capacity of the grain.

Observations during a series of years have shewn that the tendency to germinate in the ear is a varietal character, wheats from southern countries such as Asia Minor, Afghanistan, Siberia, etc., being specially prone to the defect in contrast to those from more northern latitudes. Moreover, this contrast is also reflected in the corresponding low germination capacity of the crop of grain from *Triticum durum* due to its tendency to germinate in the ear. *T. persicum* also tends to shew the defect under conditions of excessive humidity, whilst *T. dicoccum* is resistant in this respect. The numerous biochemical processes taking place in the seed after harvesting also play their part in varietal differentiation as regards germination, as is again exemplified by *T. durum* which in northern regions frequently produces grain, which though apparently healthy is unfit for seed.

Such problems call for the co-operation of the physiologist, the biochemist and the breeder, the task of the latter being to ascertain what initial material is available, to test the inheritance of the characters in question and the effectiveness of selection applied to them and ultimately the production of desirable new forms and combinations.

Observations made in 1925 are cited on differences in the germination capacity of hard and soft wheats under various conditions and the possible roles played by the composition of the seed and earliness and lateness in determining the results obtained. Further data from 1933 confirmed the existence of varietal differences in germination capacity and similar differences were also recorded in hybrids which differed according to the combination of varieties from which they had been derived by crossing. The highest germination capacity was shewn by the hybrids of Marquis x *T. 85 sibiricum*. An admixture of Indian or southern varieties in a pedigree apparently reduces the germination capacity. Nevertheless these southern forms should be suitably utilized in hybridization for their combination of earliness and large grain in order to produce suitable varieties for northern regions. Moreover many northern wheats suffer from the defects of low germination capacity and the tendency to germinate in the ear. Hence the selection of suitable parent forms is essential.

The complicated nature of the problem and of the environmental as well as the varietal factors involved calls for full investigation in which suitable conditions should be artificially provided to facilitate the requisite tests. Resistance to diseases found in damp climates in northern regions could also be investigated in a similar manner.

943. LUK'JANENKO, P. P. 633.11:575.127.2
(Breeding hard winter wheat by the method of interspecific hybridization).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 : 43-47.

A preliminary report on crosses between *Triticum vulgare* (winter forms) and *T. durum* (spring forms) made in order to obtain suitable varieties for various regions in the U.S.S.R. The *T. durum* varieties used comprised semi-winter types as well as the spring forms which included local races in addition to varieties from geographically distant regions.

The fertility of the F_1 was rather high, the variation in the number of grains per spikelet in the different pairs crossed being 0.5-1.7 as compared with 1.3-2.2 for the parent forms. Fertility in F_1 and F_2 was markedly affected by external conditions, and it was reduced by spring sowing, and the number of sterile plants in the second generation might even attain 80 per cent, whereas with winter sowing they scarcely exceeded 15 per cent.

Individually plants of the *durum* type are in no way inferior in yield to those of the *vulgare* type; though the former in crosses of *T. vulgare* (winter form) x *T. durum* (spring form) is more easily harvested than the *vulgare* type. In addition to the large number (over 50 per cent in 1935) of plants with normal set equal to that of the parent soft winter types, almost all combinations included plants with a set of over 50 grains per ear and in some instances a set of 80 grains per ear was obtained. Moreover certain crosses indicated the possibility of isolating high yielding unawned forms of *T. durum* winter wheat.

In 1935, 5,700 lines of *T. durum* winter wheat were isolated, from some of which ultimately new high yielding, *T. durum* winter wheats of superior quality may be obtained.

As regards grain characters in the F_1 from *T. vulgare* (winter form) x *T. durum*, it was found that the *T. durum* characters, and in particular high nitrogen content, were dominant. Data from various trial sowings of the parent forms and the F_1 are put forward to shew that by interspecific crossing it should be possible to isolate winter forms with a high protein content. In F_2 a certain amount of mutual recombination of various species characters was observed, as for example, the appearance of the brush on the grain in groups of plants resembling the *durum* parent, and similarly the occurrence within a group of the *vulgare* type, of plants with exceptionally vitreous grain, a characteristic of *T. durum*. On the whole, however, the soft wheat types were far more constant as regards grain characters. Judging from the behaviour of the F_3 from a reciprocal cross of Kharvestkvin with Ukrainka, in general the lines of the *durum* type displayed little cold resistance, while lines of the *vulgare* type were equal in resistance to *T. vulgare* varieties. Exceptions to both these observations were, however, also recorded and are attributed to the interchange of hereditary factors—a theory which agrees with the fact that winter hardy forms of *T. durum* have already been obtained. A difference between F_1 generations from the direct cross *T. vulgare* (winter form) x *T. durum* (spring form) and from its reciprocal was evident from the fact that in the first case cold resistance was dominant but in the second recessive. Hence it would appear that in the first place the direct cross must be used in breeding work with *T. durum* winter wheats.

944.

633.11:575.127.2

633.11 Kamalinka

633.11 Kolkhoznitsa

POKROVSKII, V. A.

('Kamalinka' and 'Kolkhoznitsa').

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 46-49.

In order to meet the different needs of the various districts of the Krasnojarsk region, new varieties of wheat are required. Among the recent productions of the Krasnojarsk Station are Kamalinka E. 223 and Kolkhoznitsa E. 478 derived from an interspecific cross between Khludovka and a local form of *Triticum durum* v. *hordeiforme* and released for multiplication. The new varieties resemble the variety Leda in vegetative period, quality of the seed and resistance to diseases and have the additional advantage of being resistant to lodging. It is suggested that they may replace Leda (also derived from Khludovka) and should be distributed for testing.

945.

BULAVAS, J.

633.11:575.127.5:633.14

Kviečių—rugių hybridai. (Hybrids of wheat and rye).

Žemės Ūkio Akad. Metraštis 1936 : 10 : 204-15.

At the Dotnuva plant breeding station F_1 intergeneric wheat-rye hybrids have been obtained by artificial cross-pollination, *Triticum vulgare* L. and *Secale cereale* L. being used as the parent forms. In the F_1 the wheat characters were mainly dominant or intermediate, while the rye character, pubescence at the base of the ear, was also dominant.

The hybrids have longer ears and glumes and are sterile, open pollination resulting in a set of only 0.02 per cent.

946.

633.11:575.127.5:633.14

DERŽAVIN, A. I.

633.11:575.127.5:633.289:581.143.26

(Breeding perennial varieties of wheat and other plants).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 : 20-24.

Since 1930 work on the production of perennial forms of barley, wheat and rye has been in progress. The three methods used for wheat are hybridization of wheat with perennial rye and with *Agropyrum* and the selection of perennial wheats from wild and cultivated forms.

The most promising of the wheat-rye crosses have been *Leucurum* 1364/1 x *S. montanum* and Stepnjačka x *S. montanum* and from the first-named combination a fertile perennial hard wheat was obtained comprising lines with 49-39 grains to the ear and a thousand corn weight of from 43.7 to 44.2 grm. These yields were obtained from vernalized seed without irrigation

or manuring. Normally developed hybrids of increased yielding capacity proved resistant to brown rust and drought. Their winter-hardiness has still to be fully tested. Their main defect is brittleness of the ear but it is hoped that in the course of segregation forms without brittle ears may be obtained as has already been done by hybridization with non-shattering forms. Crosses are also contemplated between wheat and perennial rye with a rough rachis experimentally obtained by crosses of cultivated and wild perennial rye.

So far only a few F_1 combinations from wheat crossed by *Agropyrum* are available but an F_2 consisting of 100 plants has been raised from *Agropyrum elongatum* x *Melanopus* 0122. Comparing the perennial wheat x rye and wheat x *Agropyrum* hybrids the latter are seen to have a great advantage in their resistance to fungus diseases. On the other hand their yield is very low.

The likelihood of the existence of undiscovered wild perennial wheats, particularly among the wild wheats of Armenia, is mentioned.

Among the advantages cited which the perennial forms of various crops such as cereals, flax and sunflower have over the annual forms is high yielding capacity in successive years which ensures a second crop of hay and in the case of some spring forms, even a second crop of grain.

The different developmental stages shewn by various groups of plants and their relation to tillering capacity are discussed.

Suggestions for meeting various difficulties that arise in the cultivation of perennial forms and a statement of future aims in the production of perennial wheat conclude the paper.

947. KATTERMANN, G. 633.11:575.127.5:633.14:575.129
Stand und Aussichten der Weizenroggenbastardierung. (**Position and prospects of wheat-rye hybridization**).
Prakt. Bl. Pflanzenb. 1936 : 14 : 266-78.

A survey of the author's and others' work on this problem (Cf. "Plant Breeding Abstracts", Vol. VI, Absts. 505, 507, 829, 830, and Vol. VII, Absts. 592, *et alibi*).

It is pointed out that it is not possible to dismiss as valueless amphidiploid wheat-rye hybrids while only one or two of the innumerable possible combinations have been realized. With the object of producing numerous amphidiploids combining different wheat and rye genomes, a scheme has been involved in which different F_1 wheat-rye hybrids will be pollinated with pollen from Rimpau's wheat-rye amphidiploid hybrid. The occasional unreduced 28-chromosome eggs which the ordinary F_1 hybrids produce will give, it is hoped, on fertilization with the 28-chromosome male gametes of the amphidiploid, new amphidiploid forms. The F_1 seeds have already been produced at Weihenstephan and Müncheberg.

948. KATTERMANN, G. 633.11:575.127.5:633.14:581.162.3
Über die Ergebnisse der Versuche mit doppelter Befruchtung bei F_1 -Weizen-Roggenbastarden. (**On the results of research on the double fertilization of F_1 wheat-rye hybrids**).
Züchter 1937 : 9 : 1-3.

The author has already shewn that unreduced F_1 egg cells of wheat-rye hybrids are of frequent occurrence (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 77). The simultaneous back-crossing of such F_1 plants with wheat and rye pollen therefore appeared to be a possible means of obtaining constant intermediate hybrids with a diploid chromosome number of 56. The method of double pollination is described. The percentage set varied between 0-95 per cent, that with wheat alone 0-30 per cent. Only a part of the F_2 progeny have been cytologically examined and no plant had more than $2n = 49$ (50?) chromosomes. Most of the grain set is probably the result of pollination by wheat, and from morphological observation of these F_2 plants the chances of success are remote.

949. 633.11:575.127.5:633.289
"Perennial" wheat in the U.S.S.R.
J. Amer. Soc. Agron. 1936 : 28 : 1061-62.

A brief note on Tzitzin's *Agropyrum*-wheat hybrids (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 594).

950. VERUSCHKINE, S. M. 633.11:575.127.5:633.289
 (The main lines of work with *Triticum-Agropyrum* hybrids at the
 Saratov station).
 Selektija i Semenovodstvo (Breeding and Seed Growing) 1936: No. 8:
 23-35.

The ease with which certain species of *Agropyrum* cross with wheat (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 836 and earlier articles) and the remarkable fertility of the hybrids shews that this section of the genus is genetically very close to *Triticum* and cytological examination of the hybrids has shewn many of the chromosomes, and even whole genomes, to be homologous. In consequence a great deal of crossing-over can take place and the later generations are distinguished from most intergeneric crosses by the presence of a large number of intermediate forms. Nevertheless there is a strong tendency for the perennial forms to be of the *Agropyrum* (or sometimes the intermediate) type and to become less frequent in the later generations.

Several very promising hybrids of the annual wheat type have already been obtained and have proved constant and cytologically balanced, with 42 chromosomes like *T. vulgare*. Many of them are distinguished by unusually high protein content in the grain, rising to over 21 per cent in some hybrids; also by their marked resistance to rust and smut. The bread baked from the mixed hybrids is somewhat better than that from the standard wheat *Lutescens* 062 and certain individual hybrids are much higher in quality.

Some of the hybrids of the intermediate type are also of great interest; they are highly productive and disease resistant like *Agropyrum*. They produce between 6 and 10 gm. of grain per plant, as compared with 2.65 for *Lutescens* 062, which more than compensates for the smaller size of the grain. The protein content of this group was still higher, amounting to 22.3 to 24.5 per cent in different lines, compared with 17.2 per cent in *Lutescens* 062. Their chromosome number is in the neighbourhood of 56, one full *T. vulgare* complement ($2n = 42$) being evidently present in addition to at least seven pairs from *A. intermedium*. They therefore represent a new series of 56 chromosome wheats hitherto not existing. Although at Saratov they die during the winter, they do begin to tiller again and it is thought that in a milder region they might behave as perennials.

Both the perennial habit and cold resistance have a complicated inheritance and their combination in a single form represents a complex problem. Certain perennial forms have been obtained but their grain is small and they need further improvement.

The author points to the variety of new types appearing in distant crosses even when the tendency is for the hybrids to revert to one or other of the two parents, and considers, with Meister, that the origin of the new types is not merely a result of recombination but of mutation stimulated by the distant cross.

Mention is made of a number of cases where constant fertile forms have been obtained from distant crosses by the combination of parental genomes to produce doubled or intermediate constant chromosome numbers. Of the seven different types of balanced-genome hybrids of this kind which are possible in a rye x soft wheat cross, six have been obtained and are enumerated, clearly shewing the tendency for the genomes to form units in such crosses, preventing the production of forms with unbalanced genomes. *Triticum-Agropyrum* amphidiploids would probably be of interest for their greater size of plant and of grain.

951. *KHIŽNJAK, V. A. 633.11:575.127.5:633.289:576.356
 633.11:575.129:633.289:581.143.26
 (Cytological study of *Triticum-Agropyrum* hybrids and the method
 of breeding perennial wheats).

Proc. Azov-Black Sea Select. Cent. 1936: Issue 1: 25-30.

Cytological observations are reported on hybrids of *T. durum* with two races of *A. intermedium*, with $n = 14$ and $n = 21$ and of *T. vulgare* with the latter race. Quite high numbers of bi-valents were present in the F_1 but in spite of this the reduction division was very irregular and considerable sterility resulted. Similar results were obtained with certain other species of both *Triticum* and *Agropyrum*.

* An extended summary of this paper is on file at the Bureau.

The F_1 plants were mainly sterile but certain individuals were more fertile than others on pollination with the parents; the plants produced had chromosome numbers that indicated an origin from an unreduced female gamete, being sesquidiploids. The same occurred on pollinating with a third species, so that from the hybrid *T. durum* x *A. intermedium* by pollination with *T. vulgare* a triple hybrid with 56 chromosomes was obtained and by pollination with *A. elongatum* a triple hybrid with $2n = 70$. This latter hybrid was very vigorous in growth, wheat-like in type, perennial and fairly fertile.

In these various hybrids pairing occurred between certain of the *Triticum* and *Agropyrum* genomes, some of the extra *Agropyrum* chromosomes remaining as univalents and others pairing autosyndetically. Thus the A, B and D genomes are considered to be homologous in the two genera, though considerably modified during evolution. Two further genomes X_1 and X_2 are peculiar to *Agropyrum* and not found in wheat at all.

By back-crossing the hybrids to the F_1 plants producing unreduced gametes it is hoped to obtain balanced chromosome types that combine the desirable qualities of the wheat parent with the perennial habit and hardiness of the *Agropyrum*.

952. AFANASSIEVA, A. S. 633.11:576.312.36:537.531
 Sur la persistance de l'action des rayons X. (On the persistence of the action of X-rays).

Rev. Cytol. Cytophysiol. Vég. 1936 : 2 : Pp. 13.

The cytological irregularities in the root-tips, produced by X-ray irradiation of the dormant grains of *Triticum vulgare* var. *caesium* 0111 (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 170) were no less frequent when the grains were kept in the dormant condition for three, six or twelve months before germination and examination than when the root tips were fixed twenty-four hours after treatment. The effect of X-rays is therefore persistent.

953. MATSUMURA, S. 633.11:576.356.5:575.127.2:575.11
 Genetische Studien über die pentaploiden Weizenbastarde. II. Vererbung der von den Chromosomenzahlen unabhängigen morphologischen Eigenschaften bei der Verbindung *Triticum polonicum* x *T. spelta*. (Genetical studies on pentaploid wheat hybrids. II. Inheritance of the morphological characters independent of chromosome numbers in the combination *T. polonicum* x *T. spelta*).

Jap. J. Genet. 1936 : 12 : 289-306.

This contribution (Cf. also "Plant Breeding Abstracts", Vol. VII, Abst. 604) deals with the characters pubescence of nodes, awnedness, pubescence of the empty glume and relative lengths of the inner and outer palea. Data are given to shew that these are inherited independently of chromosome number in the cross *T. polonicum* var. *vestitum* Körn. x *T. spelta* var. *Duhamelianum* and are therefore located in the A or B genom. The awned condition, characteristic of the *T. polonicum* parent, is conditioned by a single recessive gene n and node pubescence, also characteristic of the tetraploid parent, by a single dominant factor H_n . These two factors shew linkage, with a cross-over value of approximately 28.5 per cent.

Pubescent glume, as found in *T. polonicum* is dominant over smooth glume, occurring in *T. spelta*, the single factor responsible being termed H_g . In *T. polonicum* the outer palea is clearly longer than the inner, while in *T. spelta* the two palea are the same length. The F_1 resembles *T. polonicum* in this respect and in F_2 the two types segregated in a 3:1 ratio; the dominant gene responsible for the *polonicum* condition is termed P . The factors H_g and P shew no linkage with each other or with the other two factors. The factor P , however, influences the expression of N and of H_g when it is present in the homozygous condition. Thus $PPNN$ plants are completely awnless while $ppNN$ plants have short awns towards the tip of the ear and $PPnn$ individuals have shorter awns than $ppnn$. Again, PPH_gH_g plants have shorter hairs on the glume than have ppH_gH_g plants.

Discussing other workers' results, the author criticizes Raum's explanation of the inheritance of awns (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 309) as incompatible with the cytological findings.

954. YAMAMOTO, Y. 633.11:576.356.52:576.354.4
Ein haplo-diploides Zwillingspaar bei *Triticum vulgare* Vill. (A haplo-diploid pair of twins in *T. vulgare* Vill.).
Bot. Mag. Tokyo 1936 : 50 : 573-81.

From about 3,600 grains of the wheat Saitama No. 27 seven pairs of twins were obtained, one pair being haplo-diploid. The haploid member was smaller and had shorter and narrower ears than the diploid. In the pollen mother cells $2I_1$ was the most frequent configuration, I_{II} to $3I_1$ occurring in other cells and I_{III} in one cell. The distribution of univalents to the poles agreed well with that expected on a basis of random distribution, except that the cases 0-21 and 1-20 were somewhat more frequent than expected, the former occurring with a frequency of 0.7 per cent. Regression of both the first and second divisions was observed. The tetrads were mostly normal, though dyads and other abnormal forms were seen. Only 0.7 per cent of the grains were normal in appearance.

The epidermal cells of the haploid were clearly smaller than those of the diploid. Although no more than three bivalents were ever observed in one cell, their different shapes indicate that the three genomes A, B and D may actually be capable of producing six bivalents as Kihara has said (Cf. "Plant Breeding Abstracts", Vol. I, Abst. 161).

955. NEMLIENKO, N. E. 633.11:581.162.3:578.08
(An experiment in crossing winter wheat on ears that have been cut off).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 40-42.

A method analogous to that of Pope (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 553) was used in crossing (1) Ukrainka and *Lutescens* wheats and (2) Ukrainka and *Aegilops cylindrica*. In the first of these crosses, five ears of Ukrainka were emasculated after being severed from the stem and were then pollinated three days later; while in the second cross pollination was repeated, first three days after emasculation and a second time five days after. The percentage set from cross (1) was 16 and from cross (2) 15.4, 16 seeds being obtained in the former and 22 in the latter. The seeds were shrivelled up and had a thousand corn weight of from 7.50-8.10 grm. Germination tests, however, resulted in normal seedlings and though two of the young plants from cross (2) and three from cross (1) ultimately died, little significance can be attached to that since the same occurred in sowings of Ukrainka raised from quite normal seed.

All the seeds may, it is believed, be regarded as of hybrid origin.

The advantage of the method in avoiding the ill effects of bad weather on hybridization work and its possibilities as regards seed transport are evident. Research is to be carried out on the best method of preventing the shrivelling of the seed by providing suitable conditions for its maturation.

956. SAFIN, K. A. 633.11:581.162.3:578.08:575.127
(How to raise the percentage set in crossing forms of wheat with different chromosome numbers).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 42-44.

Particulars are given of an adaptation of Luk'janenko's method of group pollination of wheat plants with pollen from ears severed from the stem (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 325). It is claimed that the technique obviates the difficulties that arise from asynchronous maturation of the pollen and ovaries. The percentage set obtained ranges from 84.7-24.3, the corresponding figures when the ordinary method of pollination was used being 15.6 and 5.2.

In view of the possibility of the low set obtained in some crosses being due to failure of the pollen tubes to germinate in the dried up flower, particles of the stigma of the male parent *Erythrospermum* 01630 were introduced into the flowers of the female parent, Timofeevka, (a form which does not cross with ease) three days after emasculation and the ear was then massaged in an upward direction. Group pollination was then carried out as before and a set

of 50 per cent was obtained as compared with 20.4 per cent when no stigma particles were inserted in the flowers for pollination and 0.5 per cent by the ordinary method. The significance of the stigma particles in the process of fertilization is to be investigated.

957. REICHERT, F. 633.11:581.192:575
 Sobre una posible diferenciacion quimica de distintas variedades de trigo.
 (On a possible chemical differentiation of different varieties of wheat).
 An. Acad. Nac. Agron. Vet. B. Aires 1935 (1932/34) : 1 : 169-93.

The chemical composition of the expressed sap of three varieties of wheat, differing in baking quality, 38 M.A., Favorito and Fideo, was analysed at intervals during their development and quite definite differences were found in the varieties studied. Analyses of this kind are thought to be of value in breeding work.

958. DRAHORAD, F. 633.11:581.48:664.641.016:551.563
 Qualitätsbewertung alpiner Weizen. (Quality valuation of Alpine wheat).
 Landeskultur 1936 : 3 : 158-63.

The author first emphasizes the necessity of an Alpine cereal cultivation. He then mentions that the subjective estimation of the wheat does not always agree with the results of investigation with the farinograph and this applies especially to wheats from Alpine districts. Indeed one finds wheats of superior quality among these wheats which on an external basis have been deemed poor. Such a good quality wheat is the variety "Plantahof" bred by the author from a Swiss indigenous variety. After a short description of the characters of "Plantahof" as well as its distribution the author finds an explanation of the contradiction between the external nature of the grain and the inner baking value in the influence of the Alpine climate which he briefly indicates. By means of micro-photographs of longitudinally divided grains of two improved wheats, namely "Plantahof" and "Austro-Bankut", it is shewn that in the first the testa is raised up from the endosperm which causes a superficial wrinkling of the grain thereby resulting in an inferior external texture, while in the second the pericarp and seed coat fit the endosperm without any space between so that the grain has a better texture. A subjective estimation has therefore many inherent defects. A. B.

959. BOJAKOV, M. D. 633.11-1.524.4:575(47)
 (A study of local wheats of the Sverdlovsk region).
 Selektcija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 64-67.

From six stations in the region in question 29 collections of wheat were examined from the standpoint of the relative frequency of occurrence of different botanical varieties composing them, their economic features, their resistance to fungous diseases, lodging, their yield and certain utility characteristics of the constituent varieties.

It is concluded that the local wheats of the Sverdlovskaja district should be valuable as material for breeding and hybridization work.

960. COSTANTIN, J. 633.11-2.452-1.521.6:575(7)
 Les recherches sur le blé et les rouilles dans l'Amérique du Nord.
 (Research on wheat and rusts in North America).
 Ann. Sci. Nat. 1936 : X.Ser.Bot. 18 : I-XXXIV.

Observations on the achievements of investigators of the problem of producing rust resistant wheats in Canada and U.S.A.—with a bibliography relating to the work of the Winnipeg laboratory.

961. GREISENEGGER, I. K. 633.11:664.641.016
 Weizenschauen auf Grund farinographischer Untersuchungsergebnisse.
 (Wheat shows on the basis of the results of investigations with the farinograph).
 Landeskultur 1936 : 3 : 53-57.

Since 1929 the annual Federal wheat shows were instituted under the direction of the Niederösterreichischen Landwirtschaftskammer. Up to 1931 testing was limited to a few characters.

After this the results of baking researches were taken into consideration. 1935 brought the second far reaching change when researches with the farinograph were the main object and individual baking investigations were discarded. By the physical testing of the flour the separate treatment of summer and spring wheats was given up, which must be regarded as a great step forward. The second advantage of the valuation is that several different characters are given a single uniform expression. In the future the valuation of baking quality at wheat shows should be made on the basis of the farinograph, the other characters should be determined but not used in estimating the ultimate value. Further observations on methods of judging are given. A. B.

962. IWANOFF, I. and CHRISTOFF, I. 633.11:664.641.016:575(49.7)
[**The Bulgarian wheats. Grain, flour and baking qualities. II. The new wheat varieties. (Harvests of 1929/30, 1930/31 and 1931/32).** Annu. Univ. Sofia 1935/36 : 14 : Fac. Agron. Sylvicult. Livre I.-Agron. : 53-92.

Data are given on the yield and quality of the following new varieties bred at the Russe experiment station: No. 7 (*T. vulgare* var. *sardoun*), No. 14 and No. 16 (*T. vulgare* var. *fer-rugineum*), No. 84 and No. 159 (*T. vulgare* var. *erythrospermum*). The first four were derived by individual selection and No. 159 by hybridization between a land wheat and the variety Noe.

963. CUTLER, G. H. and WORZELLA, W. W. 633.11:664.641.016:578.081
The wheat meal fermentation time test for measuring quality in wheat.
Circ. Purdue Agric. Exp. Sta. 1936 : No. 218 : Pp. 14.

Details are given of the technique of the test, using 10 grms of meal.

964. GREISENEGGER, I. K. 633.11:664.641.016:578.081
Die Ergebnisse der objektiven Untersuchung und die Backwerte der Weizen.
(**The results of objective research and the baking value of wheat.**)
Landeskultur 1936 : 3 : 10-14.

The author comes to the following conclusions on the basis of investigations of extensive material. Between the qualitative characters of wheat and the baking value determined by the farinograph there are more or less clearly demonstrated relations. Wheat with high hectolitre weight, low thousand corn weight and high percentage of vitreous grain shews a high baking value. Less certain are the relations between hectolitre weight and thousand grain weight and between wet and dry gluten. The wet gluten content agrees better with the baking value than the dry gluten content and therefore determinations of the latter are superfluous. In the valuation of wheat for the trade, the baking value determined by the farinograph is sufficient, but for breeding work other characters should also be taken into consideration. A. B.

965. HAFNER, V. 633.11:664.661.016:581.5
Farinographische Qualitätsbeurteilung der Weizen nach Florengebierten.
(Ein Beitrag zur Schaffung von Sortenanbaugebieten). [**Quality estimation of wheat by means of the farinograph according to ecological districts. (A contribution to the creation of districts for variety cultivation).**]
Landeskultur 1936 : 3 : 108-13, 142-46.

Between the natural ecological districts and wheat quality there is a definite connexion which is worthy of attention from a breeding point of view. The author has undertaken to investigate how the quality of the most important four spring and ten winter wheat varieties behaves in a single ecological district of a part of Austria and so to shew in which districts the individual sorts give the best quality. About 1,200 tests were made during the two years given to the work. The following were considered: hectolitre weight, wet gluten and dry gluten and the baking value as determined by the farinograph. Besides a tabular survey the behaviour of

each variety in the different districts is separately described. In this way it is possible to form a judgment on the true quality of the individual varieties. It is of great importance for the practical farmer to know that it is possible for him to find out which variety is most suitable for his district. These results form a basis for the creation of varietal districts. A. B.

966. MAYR, E. 633.11.00.14
 Ergebnisse der Erkennungsversuche der im Zuchtbuch eingetragenen
 Getreidesorten. I. Sortenbeschreibung der Weizenzuchtsorten. (**The
 results of researches on the recognition of cereal varieties recorded
 in the breeding book. I. Varietal descriptions of the wheat varie-
 ties**).
 Landeskultur 1936 : 3 : 255-59.

Up to now in the State Pedigree Records 16 winter and 6 spring wheat varieties have been entered. These are being tested for their characteristics (identification tests) and for their yield (in evaluation tests). On the basis of the identification tests there follows varietal descriptions whilst the results of the evaluations can only be given after three years' repetition. The basis of the identification and evaluation tests was communicated by the author in a paper which appeared in "Landeskultur" 1935: No. 11. A tabular review facilitates the study of the results. A. B.

967. KIHARA, H. and
 LILIENFELD, F. 633.11 *Aegilops*:575.127:633.289:581.331.2
 Riesenpollenkörner bei den F_1 -Bastarden *Aegilops squarrosa* x *Haynaldia*
villosa und *Aegilops caudata* x *Aegilops speltoides*. (**Giant pollen grains
 in the F_1 hybrids of *Ae. squarrosa* x *H. villosa* and *Ae. caudata* x *Ae.*
speltoides).**

Jap. J. Genet. 1936 : 12 : 239-56.

A detailed study of the meiotic processes leading to the formation of giant pollen grains in the above mentioned hybrids is presented with a survey of the finding of previous workers on the subject.

In the *Ae. squarrosa* x *H. villosa* hybrids, raised under conditions of drought, pollen grains with from four to five nuclei and either one or two germ pores were observed. The causal factors leading to the formation of such grains are defective spindle formation combined with an extremely rapid metaphase; or incomplete formation of the cell wall in cells with two or three nuclei at interkinesis; or delay in the onset of the second maturation division which does not begin until the germ pores are being formed and is not completed. The giant pollen grains of this hybrid degenerated at an early stage as did those formed from tetrads.

Also in the *Ae. caudata* x *Ae. speltoides* hybrid defective cell wall formation was observed. The giant pollen grains, which were functional on *Ae. speltoides* and on the hybrid are attributed to regression of the first or second maturation division or, in most cases, of both. The grains are of normal appearance, have from 1-4 germ pores, and are in all probability tetraploid. From the good set obtained on pollination it is inferred that similar restitution processes occur in the formation of female gametes resulting in functional ovules.

OATS 633.13

968. ÅKERBERG, E. 633.13:535.371:575.11
 633.13:575.242:535.371
 Om fluorescensen hos gul- och vithavre samt hos vissa fatuoider. (**On the
 fluorescence of yellow and white oats and of some fatuoids**).
 Nord. JordbrForskn. 1936 : No. 5-6 : 313-21.

In ultra-violet light the grains of white and yellow oats can be distinguished by their fluorescence. Crosses of white x white and yellow x yellow gave only grains with their characteristic fluorescence but white x yellow gave plants also with the weak fluorescence of heterozygotes in the ratio white, heterozygote and yellow of 1 : 2 : 1.

An examination of fatuoids shewed that as a rule the fatuoids from white oats were yellow. White fatuoids from yellow oats have not been observed. White fatuoids among white oats may also occur but much less frequently and they cannot be distinguished by means of their fluorescence.

969. LOVE, H. H. and CRAIG, W. T. 633.13:575.182.061.633
The occurrence of striped-leaved plants from a cross between two varieties of oats.

J. Amer. Soc. Agron. 1936 : 28 : 1105-11.

In the F_2 of a cross between the oat Ruakura and *Avena sterilis macrocarpa*, 17 out of 386 plants bore yellowish stripes on the leaves, leaf-sheaths and glumes. The striped plants on selfing produced all-green, striped and yellow or white plants, while in reciprocal crosses with all-green plants variegated or yellow plants were produced only when the female parent was variegated. This and the absence of any definite ratios in the progenies shew that the character is inherited through the cytoplasm.

970. KUDRJAVTSEVA, N. 633.13-2.452-1.521.6
(Varieties of oats resistant to rust).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 : 35-37.

The performance of numerous Russian varieties of oats resistant to rust is recorded with special reference to Aristata 339²/₂₄ and Nos. 26-1363 and 26-1655 bred by the Verkhnjac and Mironov Stations in the Ukraine. Particulars are given of the yields, morphological features determining resistance to rust and lodging, as well as the original adaptation of the varieties.

RYE 633.14

971. PILL, M. 633.14 Jõgeva rye No. 1
 633.14 : 575(47.4)

Jõgeva rukis nr. 1. (Jõgeva rye No. 1).

Bull. Pl. Breed. Sta. Jõgeva Nr. 74.

Von Lochow's Petkus-rye is not winter-hardy enough for Esthonian conditions. To improve this quality in the named variety the Jõgeva Plant Breeding Station crossed it in 1921 with a local winter-hardy variety. From this cross plants have been selected in the course of 15 years with more compact heads of the Petkus type, and now this improved Petkus rye has been brought out under the name of Jõgeva rye No. 1.

As compared with Sangaste rye, Jõgeva No. 1 has a shorter straw, a more compact ear, is less winter-hardy, more resistant to lodging, gives a better yield with a lower yield of straw and, as regards quality, almost corresponds to Sangaste rye. It is therefore a winter rye which could be grown by farmers who are not satisfied with Sangaste rye and desire a variety with a more compact head.

M. P.

972. KRASNJUK, A. A. 633.14:575.11:581.49
(Some findings on the genetics of rye).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 : 50-53.

The findings of certain previous workers on liguleless cereals are cited. Instances are then recorded of the segregation of liguleless forms as a constant character in the F_3 in three inbred progenies from one family of the Eliseevskaja variety of rye and it is inferred that the character must also have been present in the F_2 . Later it was discovered in the F_1 of other progenies.

Observations on forms obtained by mass isolation and in crosses between liguleless and normal rye shewed the normal form to be dominant, the ratios obtained indicating that the contrasting characters had a monohybrid factorial basis. Any deviations from the expected ratios are attributed to environmental factors and the presence of transition forms difficult to classify as belonging to one group or the other.

The liguleless form exhibited an extremely high degree of fertility which, judging from crosses with normal rye, again proved to be a simple mendelian dominant, in contrast to the results of other workers. Moreover, when in conjunction with the liguleless character other features such as plant height, tillering capacity, glaucousness, etc., were much more pronounced. Short stem and absence of glaucousness were recessive. (Cf. also "Plant Breeding Abstracts", Abst. 951 and Vol. V, Absts. 637 and 996.)

973. KRASNIUK, A. A. 633.14 : 575.14
(Fertility of rye on inbreeding).
 Socialistic Grain Farming, Saratov 1935 : 4 : 84-87.

Observations of the author have shewn that the loss of yield through blind florets in rye in the period 1932-34 amounted to as much as 25-30 per cent. Experiments on inbreeding, however, have shewn that those lines displaying the greatest fertility on inbreeding also give the least loss through blindness in the field, giving a fertility of 80 and even up to 100 per cent as opposed to an average fertility of 58 per cent for the unselected parental line.

MAIZE 633.15

974. PERRY, H. S. and SPRAGUE, G. F. 633.15:575.113.4.061.6:575.116.1
A second-chromosome gene, Y_3 , producing yellow endosperm color in maize.
 J. Amer. Soc. Agron. 1936 : 28 : 990-96.

Crosses between white endosperm stocks of the genotype y_1y_1 and another white endosperm stock produced only yellow F_1 grains and gave nine yellow to seven white in F_2 , indicating the presence of another factor similar in effect and complementary to Y_1 . This was confirmed by further crosses and the new gene, Y_3 , was found to be very closely linked with *al* (albescens). By trisomic tests *al* was located in chromosome 2, to which Y_3 therefore also belongs. Their exact locations are not known but they appear to be near the locus of *lg_1*.

975. WRIGHT, A. H., NEAL, N. P. and DELWICHE, E. J. 633.15:575.12
What is hybrid corn?
 Circ. Wis. Ext. Serv. Coll. Agric. 1936 : No. 282 : Pp. 15.
 A popular account of the production and use of hybrid maize.

976. SALAMOV, A. B. 633.15:575.14
[Some questions regarding the breeding of maize by the method of selfed lines (inbreeding)].
 Selektssija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 37-40.

The possibility of utilizing inbred lines in the early generations F_2 and F_3 as material for the production of synthetic varieties without a preliminary study of the lines in hybrid combinations was examined.

The local variety, white Caucasian maize, which is of the flinty type but in which, however, dent and other forms are also found, after being selfed for only one generation, exhibited a number of lines which were uniform as regards the dent character of the seed, though admittedly far from constant for other characters. Populations from other regions could, by inbreeding, be similarly freed from admixtures of undesired types.

Data are also cited to shew that it is possible to obtain high yielding lines of maize by selection from hybrids between pure lines. The quality and uniformity of the lines were also promising. Moreover, by the use of the method described, the probability of obtaining high yielding inbred lines is greatly increased and also the effectiveness of the process of inbreeding.

The practice of visual inspection, which was used in these experiments, should be adopted in work of this kind to simplify the selection for certain characters and to save time.

977. JONES, D. F. 633.15:575.247.061.6
Mutation rate in somatic cells of maize.
 Proc. Nat. Acad. Sci. Wash. 1936 : 22 : 645-48.

Coloured spots occurring in the aleurone of otherwise colourless seeds that were originally homozygous *AcRPr* are attributed to somatic mutation, presumably from the recessive to the dominant condition. The mutation rate was estimated as approximately 1 in 14,000,000 somatic cells.

978. ŠOKOLOV, B. P. 633.15:575.42:581.162.3:578.08
(Questions of the moment relating to methods of maize breeding).
 Selektcija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 :
 33-34.

Brief descriptions are given of the three methods frequently employed in maize breeding, namely mass selection, individual selection and inbreeding with criticisms of their defects and the following method of group isolation, combined with paired crosses, is suggested as a substitute. From the variety for improvement, the desirable plants are taken out before flowering and plants with similar characteristics are kept separately under the usual parchment isolators and crossed *inter se*. The progeny of the various pairs crossed are then sown out the following year, in separate plots and the whole process is repeated. To ensure that the number of plants of the desired type increases from year to year, more pairs must be used each year. Hybridization must be continued until a sufficient degree of constancy is attained when the new variety may be multiplied in the usual way.

The method is under test at the Ukrainian Institute for Seed Production and it is hoped that other stations will co-operate.

979. RANNINGER, R. and LERNER, E. 633.15:576.341:575.42
 Hochsaugkräftige Maispflanzen haben qualitativ höherwertige Kolben.
(High suction force in maize plants have cobs of qualitatively high value).
 Landeskultur 1936 : 3 : 81-84.

The author has tested and utilized the results of A. Buchinger on suction force on maize for the first time. The relation between high suction force and quality has been studied with great care on extensive material and the results have been arranged in tabular form and shortly described. The author himself writes: "the relation between high suction force and quality is so great that all expectations have been exceeded, a selection on the basis of high suction force is therefore suitable to maize, not only to secure a higher yield of green matter in dry districts but also to affect the quality of the cob so that a considerable increase in yield of grain results". At the conclusion of his very interesting and valuable work the author gives several reasons why the breeder should not neglect suction force determinations.

A.B.

980. 633.15:576.356.2:535.61-31
 633.15:575.243:535.61-31
 STADLER, L. J. and SPRAGUE, G. F. 633.15:537.531
Genetic effects of ultra-violet radiation in maize. I. Unfiltered radiation. II. Filtered radiations. III. Effects of nearly monochromatic λ 2537, and comparison of effects of X-ray and ultra-violet treatment.
 Proc. Nat. Acad. Sci. Wash. 1936 : 22 : 572-91.

Pollen carrying dominant genes for a number of endosperm characters was subjected to the unfiltered radiation from a mercury-vapour arc and used to pollinate plants recessive for these characters. The treatment caused a marked increase in deficiencies affecting all or part of the endosperm; in the latter respect it differed from X-ray treatment of the pollen, which has little effect on the frequency of fractional endosperm deficiencies. The average size of the fraction shewing deficiency was approximately a half of the endosperm.

In some of the F_1 plants defective pollen occurred, which, in the absence of rings or chains at diakinesis, is attributed to deficiencies rather than to translocation. The proportion of these deficiencies which could be transmitted through the ovules was surprisingly high. Genetic evidence for translocation was observed in one case, but this has not yet been confirmed cytologically.

Mutations affecting seed and seedling characters were obtained in the F_2 produced by selfing the F_1 . The number of cases in which apparently unrelated mutations occurred together was higher than that expected by chance coincidence.

In a further series of experiments described in the second paper, the relative effects of different wave lengths in inducing endosperm deficiencies were compared by using radiation which

had been filtered by passing through solutions of mercuric chloride and hydrochloric acid of three different strengths, each cutting off radiations with wave lengths below a certain value. By this means it was found that wave lengths of 3130 Å and greater are relatively ineffective and that 3032 Å, though effective, is less so than shorter wave lengths. Some of the effective wave lengths occur in sunlight.

The deficiencies for *A* and *Pr* affecting the entire endosperm induced by the treatments were approximately equal but the fractional deficiencies for *A* were much more frequent than those for *Pr*. The frequency of germless seeds induced was low compared with that obtained in X-ray experiments and decreased as the intensity of the shorter wave lengths decreased. The differences between different wave lengths are due at least in part to their ability to penetrate to the nucleus.

Further data on the effectiveness of different wave lengths were obtained by comparing the filtered radiations with the radiation from a mercury discharge tube; this radiation consisted, in the genetically effective region, of 97 per cent of wave length 2537 Å and was therefore, practically monochromatic. It was found that the maximum dose tolerated was much lower in the case of the shorter wave length and that the frequency of induced deficiencies and of germless seeds was much greater per unit of energy applied at the surface of the pollen grain. The relative frequencies of deficiencies at different loci were however substantially the same. As far as could be judged from the small populations available, the relation between total frequency of deficiency and dosage of monochromatic radiation was approximately linear.

Comparable trials were made with X-ray and filtered ultra-violet radiations. They shewed that while X-ray induced deficiencies affect the endosperm as a whole (apart from "recoveries"), ultra-violet induced deficiencies include a large proportion affecting about half the endosperm. The relative frequencies of deficiencies at different loci were different in the two types of radiation, deficiencies of *A* being much more frequent than those of *Pr* after X-ray treatment, while following ultra-violet treatment the frequencies of deficiencies at these two loci were about the same. X-ray treatment caused a much higher frequency of germless seeds than ultra-violet treatment.

981. STADLER, L. J. and SPRAGUE, G. F. 633.15:576.356.2:535.61-31:537.531
Contrasts in the genetic effects of ultra-violet radiation and X-rays.
 Science 1937 : 85 : 57-58. (Abst.)

The fact that ultra-violet irradiation of maize pollen has much less effect on the frequency of translocations than X-ray treatment (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 980) might be due to the lower frequency of chromosome breaks, on the assumption that translocations only occur when two different chromosomes are broken in the same cell. A heavy dose of ultra-violet was therefore compared with a rather low dose of X-rays, the two being approximately equal in the total frequency of induced deficiencies for *A* and *Pr*. About 100 unselected F_1 plants from each treatment were examined for translocations cytologically. Only one was found in the ultra-violet progeny, while 44 per cent. of the plants of the X-ray progeny shewed translocations, several of them two or more independent translocations.

982. SINGLETON, W. R. 633.15:581.035.4:575.061.6
Effect of coloured cellophane on the production of sun-red colour in maize.
 Science 1936 : 84 : 488-89.

Experiments in which developing ears of maize were covered with cellophane of different colours shewed that red light alone is not capable of producing the sun-red colour in plants of the genetic composition *ABpl*, but it is not yet known which wave length is most effective.

983. BURNHAM, C. R. 633.15:581.331.2:575.116.1
Differential fertilization in the *Bt Pr* linkage group of maize.
 J. Amer. Soc. Agron. 1936 : 28 : 968-75.

Disturbances of mendelian ratios in certain crosses involving the gene *bt* (brittle) are attributed to a gametophyte gene *Ga₃*, which confers an advantage in competition on pollen carrying it when placed on silks also carrying *Ga₃*, the gene being closely linked to *bt*.

In certain crosses involving also the gene *pr*, another member of the same linkage group, differences in the deficiency of *bt* grains in the crossovers and non-crossovers between the *bt* and *pr* loci indicated that a second gametophyte gene, located nearer to *pr* was also operating.

984. ABBE, L. B. 633.15:581.4:575-181
**Reports of progress on projects sponsored by the American Philo-
 sophical Society. The histological background for dwarfism in
Zea mays.**
 Proc. Amer. Phil. Soc. 1936 : 76 : 743-47.

In this progress report data are given on the length and diameters of internodes and length and width of leaf blades in certain dwarf forms and indications of the relative cell sizes. No generalizations are attempted but it is pointed out that in some cases there is a suggestive connexion between cell size and internode diameter.

985. RANNINGER, R. 633.15-1.563.5:576.341:575.42
 Die erste österreichische Silomaiszüchtung mit besonderer Berücksichtigung
 der Saugkraftselektion. (**The first Austrian silo-maize breeding with
 special regard to suction force selection**).
 Landeskultur 1936 : 3 : 244-48.

Up to now there has been no silo-maize breeding in Austria; none of the varieties cultivated here ripened. Austria was therefore compelled to import all her seed for silo-maize. It is therefore of the greatest importance for both public and private economy that seed should be produced in the country. As most silo-maize in Austria is grown in very dry districts the first necessity is to breed for drought-resistance. With this is bound up high suction force and the suction force must be included as one of the most important factors for selection in silo-maize breeding. This the author has been well able to do in his silo-maize breeding, as his establishment is in the driest district in the whole of Austria. He started with the variety "Pettender" of which only 20 per cent ripened. Suction force selection carried out by A. Buchinger gave the best results in the shortest time. To-day the variety ripens 100 per cent, gives a high yield, more and larger cobs than the original material, etc. Its freedom from smut gives this variety an interest for other countries. The author is of the opinion that Austria need no longer be dependent on the importation of seed for silo-maize. The variety has been named "Ranninger Silo-maize" and has been recorded in the State Breeding Book. The work is worthy of special attention. A. B.

BARLEY 633.16

986. 633.16 La Previsión
 Cebada cervecera variedad "La Previsión". (**The malting barley
 variety "La Previsión"**).
 Bol. Chacra Exp. "La Previsión" 1936 : 2 : p. 110.

The new variety, obtained by pedigree selection from the local variety Aclimatada Rivera, is a rapid growing two-row spring barley, resistant to *Puccinia simplex* and *P. graminis*, with large grain, somewhat coarse husk, excels the original population in yield and is of good malting quality.

987. 633.16(43.6)
 633.16 Austria Schulgerste
 633.15-1.563.5(43.6)
 RANNINGER, R. 633.15 Ranninger's Silomais
 Austria-Schulgerste und Ranninger's Silomais, zwei österreichische Zucht-
 sorten. (**Austria-Schulgerste and Ranninger's Silomais, two
 Austrian breeding varieties**).
 Wien. landw. Ztg. 1936 : 86 : p. 215.

Two new Austrian breeding varieties appeared on the market in 1936, namely Austria-Schulgerste and Ranninger's Silomais. Both varieties attained the highest marks in the field certification and were included in the Breeding Book of the Zuchtbuchkommission des Bundesministeriums für Land und Forstwirtschaft. Austria-Schulgerste comes from a

Kneifel barley bred by G. Pammer in 1911. This two-rowed barley is especially suitable for dry districts; it is 120 cm. high, tillers well and does not lodge, ripens early, is free from smut, has plump floury grain and is therefore a first class brewing barley.

Ranninger's Silomais is the first and, up till now, the only Austrian variety of silo-maize and is therefore of great economic value as large sums of money are yearly expended abroad on seed. This variety of maize, which is also named Saugkraftmais, has been bred by Pettender. The high suction pressure determined by A. Buchinger has proved to be a most important point for selection. Ranninger's Silomais is resistant to drought, grows tall, produces a high yield of green matter and many cobs; the grain colour is golden-yellow and it is only slightly susceptible to smut. A. B.

988. 633.16:575(47)
 PONOMAREV, N. A. 635.656-2.183-1.521.6(47)

(New varieties of barley and peas for the North).

Selektisija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : p. 57.

The yields and the lengths of the vegetative period are given for a number of new varieties of barley obtained by selection from local types and by crossing early maturing with high yielding forms. The yield of the new barleys exceeds that of the standard variety Pioneer by 24-32 per cent.

Three naked barleys have also been obtained by selection and among them No. 1398/5 which has given a yield 7.9 per cent higher than the standard.

Similar work has been carried out with peas, and hybrids with vegetative periods of 78 and 76 days have been produced. From one of these a yield of 7.5 gm. was obtained from one plant. In yield, uniformity and size of the seed and resistance to lodging and disease the hybrids are superior to the standard variety Irlandets.

Large scale trials are being arranged.

989. IMAI, Y. 633.16:575.182.061.633:575.247
Recurrent auto- and exomutation of plastids resulting in tricoloured variegation of *Hordeum vulgare*.
 Genetics 1936 : 21 : 752-57.

White variegation in barley is known to be due to a recessive factor which stimulates recurrent plastid mutation from green to white. In a white-variegated line there occurred a seedling with yellowish leaves bearing both green and white stripes. Such tricoloured plants gave in their progeny white-variegated, tricoloured, yellow albinotic and mosaic plants. In out-crosses with normal plants the aberrant plastid type shewed maternal inheritance.

It is considered to be the result of a sporadic plastid mutation from green to yellow, the yellow plastids changing frequently to green by auto-mutation.

MILLETS AND SORGHUMS 633.17

990. 633.174:575.12:633.62
 KUYKENDALL, R. 633.174 Sagrain
Sagrain in the Yazoo-Mississippi Delta.

Bull. Miss. Agric. Exp. Sta. 1936 : No. 314 : Pp. 23.

Sagrain is a presumed hybrid between a sweet and a grain sorghum and produces rather stocky, sweet stalks and a very high yield of grain.

RICE 633.18

991. CHIAPPELLI, R. 633.18:575
 Le nuove varietà di riso al campo sperimentale. **(The new varieties of rice in the experimental plots).**
 G. Risicolt. 1936 : 26 : 97-100.

Variety No. 169 is a natural hybrid between Lady Wright and Americano 1600. It is very resistant to lodging, of medium height and abundant yield.

Variety No. 144 is a selection from Lady Wright and possesses a transparent grain.

992. SAMPIETRO, G. 633.18:575.11.061.6
L'eredità del pigmento nel riso. (**The inheritance of pigment in rice**).
G. Riscolt. 1935 : 25 : 233-39.

The variety of rice used in the investigation was one of little agricultural value and of unknown origin, named as Viola on account of the violet coloration of its glumes. The variety proved to be heterozygous and the seeds when sown gave rise to violet and green plants in a 3 : 1 ratio. There appeared to be a correlation between green colour and broad grains and violet colour and narrow grains.

993. CHIAPELLI, R. 633.18:575.242:581.49
Interessante mutazione di una varietà di riso. (**An interesting mutation in a variety of rice**).
G. Riscolt. 1936 : 26 : 162-65.

A tiller of rice was separated from the variety Sancio P. 6 from which it differed in the complete absence of ligule and auricles.

The mutation has been given the varietal name of Balzaretti and has the advantage that wild rice growing among it is readily distinguished.

994. NOGUCHI, Y. 633.18:581.162.32:578.08
The application of post-harvest pollination in the hybridization of rice-plant.
Jap. J. Genet. 1936 : 12 : 324-26.

The method (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 553) is reported to be applicable to rice.

LEGUMINOUS FORAGE PLANTS 633.3

995. FISCHER, A., SCHWARZE, P. and SENGBUSCH, R. v. 633.367:575:581.192(43)
Der Stand der Süßslupinenforschung und -Züchtung. (**The position as regards sweet lupin research and breeding**).
Forschungsdienst 1936 : 2 : Pp. 19.

1. (Fischer, A.) Geschichte und Anbau der Süßslupine. (**History and cultivation of the sweet lupin**).
2. (Schwarze, P.) Die Süßslupine als Futterpflanze. (**The sweet lupin as a fodder plant**).
3. (Sengbusch, R. v.) Süßslupinenzüchtung und -Forschung in Müncheberg. (**Breeding and research of sweet lupins in Müncheberg**).

The first and second parts of this paper (which are by Fischer and Schwarze respectively) deal with the history and cultivation of the sweet lupin and its properties and value as fodder. In Part 3 the chemical and agronomic properties of the five species of *Lupinus* grown in Germany are tabulated and the work that has been done at Müncheberg in breeding for various characteristics is summarized by a brief survey of the literature of the subject.

Problems relating to yield, the breeding of yellow and blue lupins with non-splitting pods, the relation between environment and the chemical composition of the plant and the physiological function of the alkaloids in it, should occupy future research.

A bibliography of 147 titles is given.

996. ZIMMERMANN, K. 633.367:581.47:575
Züchtung von Lupinen mit nichtplatzenden Hülsen. II. Die Teileigenschaften der Hülse, deren Modifizierbarkeit, ihre Verhältnisse zueinander und ihre Vererbbarkeit. (**The breeding of lupins with non-splitting pods. II. The part characters of the pod, their capacity for modification, their inter-relation and inheritance**).
Züchter 1937 : 9 : 3-13.

The first part of this work was reviewed in "Plant Breeding Abstracts," Vol. VII, Abst. 674. Measurements of a number of characters of the pod of lupins of splitting and non-splitting types shewed that the characters most concerned in the splitting of the pod are the thickness

of the fibrous layer and the breadth of the ventral and dorsal sutures. In the non-splitting species *L. albus* the relation of these is 1 : 3.15 : 2.48, in the easily splitting species *L. angustifolius* it is 1 : 2.22 : 1.55, and in the very easily splitting species *L. luteus* 1 : 1.82 : 1.35. Strains of each species were examined and a certain amount of variability was found in each. This can be modified by external conditions but a positive correlation was found for the three characters within a strain.

The selection of forms whose correlation of characters corresponds most nearly to that of the non-splitting species is held to be the most promising method for breeding the desired types.

ROOTS AND TUBERS 633.4

997. SIROTINA, M. 633.41:576.312.34:576.16
(Comparative caryological study of the genus *Beta* L.).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 :
 13 : No. 2 : 56-78.

Cytological examinations were made of five different subspecies of the group *B. vulgaris* and of the eastern group of species and the chromosome size and morphology were studied by Levitsky's method. Brief descriptions are given of the different species examined, their morphological features, sugar content and chromosome number followed by data on the size and form of the individual chromosomes, which are illustrated, for the species *B. vulgaris* L. ssp. *patula*, ssp. *saccharifera*, ssp. *perennis* and ssp. *maritima*, and for *B. macrorhiza* and *B. lomalogona*, all with $2n = 18$ and *B. trigyna*, races with $2n = 36$ and races with $2n = 54$. In the tetraploid the chromosomes of the different morphological classes occurred not in pairs but in fours, indicating that the form is an autotetraploid. Similarly the 54 chromosome form contained six chromosomes per class, indicating that it is an autohexaploid. *B. intermedia* is suggested as a possible diploid ancestor of *B. trigyna*, in that the two species have much in common.

The longest chromosomes of all were found in *B. macrorhiza*, closely followed by *B. lomalogona* and *B. trigyna*, the shortest in *B. vulgaris* ssp. *patula*, which in this respect differed so much from the other *B. vulgaris* subspecies that it is separated into a distinct group. In all species, however, seven distinct chromosomal types are distinguishable, the seventh type, the shortest, being represented three times. There are in all therefore three long, three medium and three short. The relative lengths of the arms in each type are the same throughout the genus. The karyological data shew that *B. macrorhiza*, *B. lomalogona* and *B. trigyna* are closely related one to the other; a second group is constituted by the various subspecies of *B. vulgaris*, with the exception of ssp. *patula* which constitutes a third group, and in all probability a distinct species *B. patula*; this species is characterized by small dimensions in its vegetative organs as well as its chromosomes.

998. Voss, J. 633.41:581.143.26:575.42:578.08
 Experimentelle Auslösung des Schossens und Prüfung der Schossneigung der Rübensorten (*Beta vulgaris* L.). [Experimental induction of bolting and tests of the tendency to bolt in beet varieties (*B. vulgaris* L.)].
 Angew. Bot. 1936 : 18 : 370-407.

Various disadvantages of the method of early sowing in selecting non-bolting strains are mentioned and a laboratory method designed by the author is described in detail. The method consists in treatment of the young seedlings at a temperature of $+1$ to $+4^{\circ}\text{C}$. for six weeks with additional illumination for 8 hours a day. Shorter periods of cold treatment proved ineffective in distinguishing between bolting and non-bolting lines. The effect of treating the seedlings was shewn to be much greater than that from treatment of germinating seeds and older seedlings (4-7 weeks) gave a more pronounced result than younger ones. Temperatures below 0°C . were ineffective. The results with the treatment described corresponded closely with the tendency to bolting observed in field experiments. Marked varietal differences in tendency to bolting and in the cold required to produce bolting were observed, both in fodder beets and in sugar beets. The sugar beets shewed in general a lower bolting tendency and required a somewhat longer cold treatment than the fodder beets.

999. ZOSSIMOVICH, V. P. 633.41-1.524.4(47.9)
(New forms of Transcaucasian cultivated beets).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 :
 13 : No. 2 : 79-81.

Transcaucasia is of interest being adjacent to the main area of form development of the genus *Beta*, which is now thought to be in nearer Asia, where the weed *B. vulgaris* was apparently first taken into cultivation. The varietal diversity of the beets in these regions is much greater and the forms are quite different from those of western Europe and the Transcaucasian expedition of 1935 discovered a great number of interesting forms, including a local cultivated white beet with flat-topped rounded roots from Armenia, of interest for mechanical lifting and also characterized by unusually large size, some roots weighing up to 2.5-3 kg. with a sugar content of 8.2-14 per cent. The number of vascular rings is often large, up to 10, and the roots are soft and free from woody tissue. The roots also have the advantage of turning black only very slowly in the air.

In the arid region of Zuvand extremely drought-resistant forms varying in sugar content from 8.2 to 13.4 per cent are found, some with flat tops.

A great number of the allelomorphs found in the Transcaucasian cultivated beets are unknown in the European varieties and in many cases entirely different linkage relationships obtain. The characters of the wild beets are still more different and many of them are of great interest in hybridization, e.g. resistance to frost, large roots, one-seeded capsules; the largest root was found in *B. lomatogona* in Zuvand, weighing 6.6 kg., with a sugar content of 5.4 per cent and a dry matter content of 26.5 per cent in the sap.

1000. CLARK, C. F., STEVENSON, F. J. and 633.491:575(73)
 MILLER, J. C. 633.491 Houma
The Houma potato: a new variety.
 Circ. U.S. Dep. Agric. 1936 : No. 420 : Pp. 4.

The new variety is a vigorous grower, high yielding, and produces smooth, round tubers of high cooking quality. It appears to be wart-resistant and highly resistant, though not immune, to the mild mosaic virus. It was first grown at Aroostook Farm, Maine, and is a seedling from the cross Charles Downing x Katahdin. Tests indicate that it is particularly well adapted to Louisiana conditions.

1001. NIXON, E. L. 633.491:575.255
Chimera as applied to new varieties of potatoes.
 Guide Post, Penn. Potato Grs 1936 : 13 : 1, 8, 16.

A popular account of chimerical structure in potatoes. Three methods of producing plants from the inner tissue of periclinal chimeras are described, namely shaving off the outer layers of the eye of a tuber, obtaining tubers from stem cuttings and growing vegetative progeny from naturally occurring tubers in which the inner tissue has emerged. By the last method a useful variety of "white rurals" was obtained from a russet variety.

1002. KÖHLER, E. 633.491:575.7:631.521.6:632.8
 Die Resistenzzüchtung gegen den Kartoffelabbau im Lichte der Virus-
 forschung. **(Breeding for resistance to degeneration in the potato in
 the light of virus research).**
 Züchter 1937 : 9 : 13-15.

The problem of breeding for resistance to degeneration has been simplified by the discovery that the numerous mosaic viruses can be grouped into relatively few systematic units. In practice the potato viruses can be divided into the harmful, the less harmful and the harmless. The first group includes, for Germany, the leaf-roll virus, mosaic Y virus, the second, mosaic A and the third, mosaic X.

It is noted that the occurrence together of the A and X viruses may in certain varieties produce a harmful combination.

Two forms of resistance occur, tolerance and preventive resistance; the first is only a necessity when breeding for the second is impossible. Tolerant varieties may constitute a danger when grown near to susceptible varieties.

1003. BERTHAULT, P. 633.491:576.16
 Sur l'origine spécifique de la pomme de terre. (**The specific origin of the potato**).

C.R. Acad. Sci. Paris 1936 : 203 : 745-47.

A study of the morphological characters of the potato found growing wild at Roque-laure (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 680) confirms the author's earlier conclusion that all the cultivated varieties of Europe have originated from *Solanum tuberosum* and that the mutations arising during the course of cultivation only form new varieties of the original species.

1004. ELLISON, W. 633.491:576.354.4:581.162.5
Meiosis and fertility in certain British varieties of the cultivated potato (*Solanum tuberosum* L.).

Genetica 1936 : 18 : 217-54.

On account of secondary associations observed at first and second metaphase it is concluded that the domestic potato is an octoploid. Frequent and striking irregularities were observed in the course of meiosis in the anther, including restitution nuclei and fusion of second metaphase plates. Some varieties apparently fail to complete the process of meiosis. Observations of meiosis in the ovule indicated that irregularities also occurred there.

Among the pollen grains were observed giant grains, dyads and irregular groups as well as normal tetrads. In regular pollen grain divisions with 24 chromosomes only one satellite chromosome could be seen. Plates with only 23 chromosomes were seen and also, in giant grains, with 96 chromosomes.

The fertility of a variety appears to be related to the time at which meiosis begins in relation to the age of the anther or flower bud; in fertile varieties it begins earlier. Genetical and environmental factors are both concerned in producing fertility or sterility.

FIBRES 633.5

1005. BARRE, H. W. 633.51:575(73)
The new coordinated federal-state cotton research program.

Presented to the Textile Section of American Society for Testing Materials at New York City, 1935 : 18th October, Pp. 11. (Mimeographed).

BARRE, H. W.

A coordinated program of cotton plant research.

Comm. Fertil., Charleston 1935 : 50 : No. 6 : 9-11, 16-18.

The work contemplated includes breeding work, with special attention to fibre quality and accompanied by researches into the genetics and cytology of cotton and will be co-ordinated throughout the cotton-growing region of the U.S.A.

1006. BROWN, H. B. 633.51:575(76.2)
Registration of improved cotton varieties, I.
 J. Amer. Soc. Agron. 1936 : 28 : 1019-20.

Brief accounts are given of the varieties Deltapine, Ambassador and Washington, bred by commercial firms.

1007. WAELEKENS, M. 633.51:575.42(67.5)
 La campagne cotonnière 1935-1936. (**The cotton campaign 1935-1936**).
 Publ. Inst. Agron. Congo Belge 1936 : Sér. Tec. No. 10 : Pp. 46.

The work of cotton selection at the Bambesa Station is described. The method of pedigree selection is fully described in the bulletin already reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 698). Self-pollination considerably improves the quality of the whole plant. Compared with that of ordinary cotton the product of the progenies of the selected strains is markedly superior and the purity of the lines becomes increasingly pronounced. The families 145 and 270 retain their good qualities and a selection, No. 15, combines the qualities of both.

Systematic roguing is practised on the progenies in process of multiplication.

The varieties under observation shew characteristic impurities. New crosses have been made between pedigree strains and an indigenous *barbadense* cotton.

1008. WAELKENS, M. 633.51:575.42(67.5)
La purification du Triumph Big Boll dans l'Uele. (**The purification of Triumph Big Boll in Uele**).

Publ. Inst. Agron. Congo Belge 1936 : Sér. Tec. No. 9 : Pp. 44.

Triumph Big Boll, a selection from Boykin Stormproof, was chosen about 1915 as the most suitable variety for the Belgian Congo. Mass and pedigree selection was practised, but the result was a mixed stock of poor quality. To improve it, the progeny of a single strain, pedigree 145, was purified by rigorous selection and self-fertilization. Comparison with the ordinary stock based on the indices of leaf and capsule and the characters of the fibre and the seed shewed the superiority of the pure strain which is destined to replace the ordinary stock.

One strain, 15.P.4. with fibre of 29–30 mm. is particularly noted.

1009. ŽUKOV, P. V. 633.52:575.12:576.356.5:581.036
(**Fixing hybrids**).
Selektcija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : p. 45.

Crosses were made between two types of flax differing in the colour of the corolla, anthers and seed. In the F_1 the blue corolla and anthers and the brown colour of the seed of the one variety were dominant to the white corolla, yellow anthers and yellow seed coat of the other variety. The hybrids were sown out in pots and subjected to cold during flowering and in the F_2 lines were obtained, some segregating and some not. The latter retained the F_1 characteristics, gave no set on being crossed with the parent forms and proved to have the reduplicated number of chromosomes. They may therefore be regarded as fixed. The controls, which had not been subjected to cold segregated for the parental characters.

The practical importance of these findings and their theoretical bearing on the origin of polyploids and homologous series in nature is indicated.

SUGAR PLANTS 633.6

1010. 633.61:575(91.4)
New Sugar Association seedlings show promise. Report on 1935-36 variety experiments.

Sug. News 1936 : 17 : 425-31.

Many of the seedlings developed by the Philippine Sugar Association were tested for the first time. The selfed seedling of P.O.J. 2878 were better yielders than the standard varieties; the best of them, P.S.A. 32, gave as much as 90 tonnes of cane and almost 170 piculs of sugar per hectare.

P.O.J. 2878 x Badila gave one very promising seedling, P.S.A. 80, with 80 tonnes of cane and 150 piculs per ha., and other seedlings were promising in certain respects.

P.O.J. 2878 x N.G. 24A and N.G. 24A x C.A.C. 87 were not promising.

Some of the seedlings from H 109 x Hind's Special were promising in sugar per tonne cane (over 1.85 piculs).

P.O.J. 2878 x J 247B was promising in both cane and sugar production (2.10 piculs and over). (P.O.J. 2878 x Badila) x P.O.J. 2878 gave one particularly good seedling, P.S.A. 76, with a yield of 78 tonnes and 159 piculs per ha., and a quality of 2.10 piculs sugar per tonne cane.

P.O.J. 2878 x C.A.C. 87 was fairly promising.

H 109 x C.A.C. 87 was promising in some and not in other respects. One variety from this cross, P.S.A. 22, shewed promise in certain respects in the ratoon cane though not in the earlier stages.

Q. 407 x C.A.C. 87 not a good variety, especially in the ratoon.

The variety P.S.A. 7, from P.B. 119 x C.A.C. 17 gave very satisfactory yields and sugar in the ratoon.

H. 109 x Co. 205 gave various seedlings which were not particularly good.

The best seedlings and varieties are considered to be P.S.A. 7, 15, 24, 30, 31, 32, 33, 38, 43, 69 and 76 and Alunan and Q 409.

1011. MANGELSDORF, A. J. 633.61:575(96.9)
Sugar cane breeding in Hawaii.
 Facts ab. Sug. 1936 : 31 : 459-62.

A brief account of the work of the genetical department of the Experiment Station of the Hawaiian Sugar Planters' Association. Breeding new varieties from seed was suggested in Hawaii as early as 1851 but it was not until 1905 that it was started in earnest, after the prohibition on the importation of sugar cane from abroad, a result of the entry of the leaf-hopper with imported canes. A product of this early work was H.109, which by 1925 was Hawaii's leading variety. In 1923 the prohibition on the importing of varieties was removed, and subject to two years' quarantine on the island of Molokai, wild species and cultivated varieties are now introduced and used in breeding. The method of cutting flowering stalks and standing them in a solution of sulphur dioxide and phosphoric acid is used extensively and greatly facilitates the work of cross-pollination.

1012. NAKAMURA, M. 633.61:575:578.08
(Simplification of the crossing technique in the sugar cane breeding by the use of sulphurous acid).
 Rept. Govt. Sug. Exp. Sta. Tainan, Formosa 1936 : No. 3 : 1-18.

The author found that it was necessary to use a pure solution of sulphurous acid; a commercial product which was tried proved a failure, probably owing to a rather high content of sulphuric acid. A solution of 0.03 per cent sulphurous acid and 0.01 per cent phosphoric acid was found to give the best results. It was advisable to change it after three days and to cut the stalk a little every six days. (Cf. also "Plant Breeding Abstracts", Vol. VI, Abst. 72).

1013. 633.63:551.563:575(78.8)
Beets for high areas.
 Facts ab. Sug. 1936 : 31 : p. 339.

The development of a strain of sugar beet in Colorado capable of growing at elevations up to 7,500 feet is mentioned.

1014. BOUGY, E. 633.63:575.12:633.416
 Hybrides de betteraves sucrières et fourragères. **(Hybrids of sugar and forage beets).**
 Publ. Inst. Belge Amélior. Better. 1936 : 4 : 281-83.

From a number of crosses between forage and sugar beets it was confirmed that the characters of the sugar beet parent were more or less dominant.

Further experiments with hybrids between the variety Vauriac and the sugar beet Kuhn shewed that the sugar content of the hybrids was 1.31 per cent greater than that of the average of the parents.

The sugar content of the hybrids of Vauriac and Vilmorin A is always higher than when the cross is in the direction of sugar x forage beet.

1015. COLIN, H. and BOUGY, E. 633.63:575.12:633.416
 La sixième génération de l'hybride Géante blanche x Sucrière Vilmorin A.
(The sixth generation of the hybrid Géante blanche x Sucrière Vilmorin A.).
 Publ. Inst. Belge Amélior. Better. 1936 : 4 : 267-70.

From the first generation of this forage-sugar beet cross and from a number of other crosses using a forage beet still less rich in sugar than Géante blanche it has been established that the sugar content of the hybrids nearly always exceeds that of the forage parent and may equal that of the sugar beet.

The F_1 and F_2 are very heterogeneous and only by the F_6 after selection for the sugar beet type is the progeny fairly homogeneous.

1016. RATHER, H. C. 633.63:575.14:575.12(77.4)
New sugar beet varieties being bred at Michigan State College.
 Sug. Beet J. Michigan 1936 : 1 : p. 97.

The method of inbreeding followed by hybridization, analogous to that used in maize breeding is being applied to the improvement of sugar beet at Michigan State College. Some of the inbred lines are resistant to leaf spot.

1017. HAAN, K. de. 633.63:581.143.26
 La montée en graines de différentes variétés de betteraves sucrières et son influence sur le rendement en poids et sur la richesse saccharine. (**Bolting in different varieties of sugar beets and its influence on yield and weight and on the sugar content**).
 Publ. Inst. Belge Amélior. Better. 1936 : 4 : 291-99.

Considerable differences in the amount of bolting was noticed in different varieties and differences were also found within the same variety if sowings were made at different times. There are varieties which shew the greatest amount of bolting during the first part of the vegetative period and early sowing increases this tendency. In others the bolting is not so great at first and time of sowing has little or no effect.

The loss in weight and sugar content is much greater in the varieties that bolt early. To avoid as far as possible the disadvantages of bolting, sowings should not be made too early, a variety resistant to bolting should be selected and one that does not shew a large number of bolters during the first part of the growing season.

1018. ABEGG, F. A. 633.63:581.143.26:575.116.1.061.6
A genetic factor for the annual habit in beets and linkage relationship.
 J. Agric. Res. 1936 : 53 : 493-511.

The F_1 , F_2 and back-crosses were studied in three crosses involving the character pairs annual *v.* biennial habit, red *v.* yellow hypocotyl and crown, and normal, pinnate *v.* plantain type of venation. Red hypocotyl is known to be due to a single dominant factor *R* and plantain venation is produced by a single recessive factor *pl*. The inheritance of annual habit as a simple Mendelian dominant (*B*) was confirmed (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 256). Dominance did not appear to be complete but evidence from the F_2 suggests that this may be due to the operation of modifying factors rather than to a difference between homozygotes (*BB*) and heterozygotes (*Bb*).

The factor *B* was inherited independently of *Pl*, but shewed linkage with *R*, the average cross-over value based on the back-cross and F_2 data being 15.5 per cent approximately. It is believed that the factor for annual habit may be a cause of bolting in commercial varieties of sugar beet.

1019. ORLOVSKY, N. I. 633.63-1.557:575
 633.63:519.241.1
(Biological particularities of individual beet plants used by agro-technics and selection for beet crop increase).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 : 13 : No. 2 : 36-45.

Reference is made to the close correlation existing between vigour of growth, leaf number and area, etc., in the early growth phases and the final yield of root in sugar beet and data are presented in illustration of this relationship. The figures also shew that there is no reduction in sugar content in the individuals with highest yield selected by this means. There is a similar relationship between the weight of the root in the early stages and its final weight at the time of lifting, and there are indications that the same applies to the size of the seed, both of which are therefore characters that deserve attention in breeding. It is particularly desirable to produce lines with a low number (1-2) of relatively large seeds per capsule, in order that the young plants may have the best possible start.

1020. 633.63-1.557:575:581.192
(The combination of high yielding capacity and high sugar content in a single race of sugar beet).
 Selektisija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 : 57-59.
 Figures obtained in 1921 and 1930 are quoted to prove the author's contention that under the local conditions of the experiments an increase in the weight of the beet root may be accompanied by an increase in sugar content, owing to the fact that both these features are due to a reduction in the size of the cells of the parenchymatous tissue. The limiting weight for this parallel increase was found to be ca. 800 grm. above which the correlation no longer holds. Further tests in 1934 with plants from the seed obtained in 1931 shewed that the line in question was highly resistant to drought and also superior to the control in percentage sugar content and in root weight. This result is attributed to its relatively long roots and small cells. The correlation between size of root and of cells is exemplified by data and figures are also given to shew that races of sugar beet differ in respect of cell size. Suitable types for dry and humid regions respectively must be produced.

1021. 633.63-2.112-1.521.6:575:578.081
ORLOVSKII, N. I. (Distinguishing varieties of sugar beet according to the degree of resistance to drought).
 Selektisija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 10 : 34-37.
 In view of the importance of breeding beets suitable for different regions the problem of determining the comparative drought resistance of varieties was studied with varieties from Russia and western Europe, with special reference to (a) reactions under drought conditions at various periods of growth, (b) the development of the root during the vegetative period in connexion with the weather conditions, and (c) the tolerance of the seedlings as regards drought. The effects of soil contour and different aspects of the site upon the various reactions were also studied.
 A detailed description of the methods used is given and a simple way of determining drought resistance by raising the seedlings in tubs under artificial drought conditions and observing their reaction at the stage when the first pair of true leaves appeared is recommended for use in selecting more resistant races of beet.
 Marked varietal differences were found in regard to yield estimated by the diameter of the root and its content of dry matter, Kharkov being included among the most resistant sugar beet varieties.
 Though, admittedly, the resistance in the seedling stage may not always coincide with the reaction at a later stage, the method of testing described is held to be of value if used in conjunction with a supplementary determination of the ultimate yield.

1022. 633.63-2.8-1.521.6:575(79.6)
Beet breeding in Idaho.
 Facts ab. Sug. 1936 : 31 : p. 391.

In this brief account of the beet breeding work of the United States Bureau of Plant Industry the curly-top resistant strains U.S. No. 33, U.S. No. 34 and the Amalgamated Sugar Company's strain No. 600 are mentioned (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 255). Work is proceeding on about fifty new resistant strains.

STIMULANTS 633.7

1023. 633.71:575.127.2:581.162.3
LEHMANN, H. Über interspezifische Kreuzungssterilität in der Gattung *Nicotiana*. (On interspecific cross sterility in the genus *Nicotiana*).
 Z. indukt. Abstamm.—u. VererbLehre 1936 : 72 : 207-57.

The following species and hybrids were used for the crosses, *N. Tabacum*, *N. Rusbyi*, *N. tomentosa*, *N. glutinosa*, *N. silvestris*, *N. rustica humilis* L. and *N. rustica brasiliensis*, *N. paniculata*, *N. glauca*, the hybrids of *N. Tabacum* crossed with *N. silvestris*, *N. glauca*,

N. Rusbyi, *N. tomentosa* and *N. glutinosa*, and the hybrids of *N. tomentosa* x *N. Rusbyi*, *N. silvestris* x *N. Rusbyi*, *N. glutinosa* x *N. Rusbyi* and *N. rustica* x *N. paniculata*, also the two-species hybrid with a doubled chromosome number *N. Tabacum* x *N. Rusbyi* and the experimentally produced three-species hybrid *N. Tabacum* x *N. Rusbyi* x *N. silvestris*.

The investigations comprised:

- (1) The determination of the degree of fertility by means of numerous pollinations and the counting of the seeds so obtained.
- (2) Germination tests of such seeds.
- (3) Histological investigation of the pollen tube growth in the stigma, style and ovary.
- (4) Histological investigation of the development of embryo and endosperm.
- (5) Pollen tube cultures and investigations on the pollen.

The experiments are described in detail and the results are fully discussed; the conclusions drawn are here briefly summarized.

The sterility of a cross may be due to disturbances in the course of development at any moment between pollen germination and the germination of the seed, also the degree of such sterility is constant, within certain limits, for any definite cross.

A comparison of the fertility indices of more or less fertile crosses of two and three-species hybrids and of two-species hybrids with the doubled chromosome number shewed that the fertility was an individual character in contrast to the strain or species fertility relations of varieties of pure species. It was found that the fertility or sterility of a cross was independent of the systematic relationships of the *Nicotiana* species investigated.

The fertility or sterility of one or other of the parents might be dominant in the hybrids or a quite new condition might occur. There appear to be no simple mendelian law for the inheritance of the sterility or fertility in the crosses.

Most of the F_1 (*N. Tabacum* x *N. Rusbyi*) forms when crossed with *N. glauca* shewed the highest or a very high fertility index while with *N. rustica* hardly any seed set. The *N. rustica* x *N. paniculata* and *N. Tabacum* x *N. Rusbyi* hybrids always shewed a relatively high fertility when back-crossed with the low-chromosome parent.

Germination of the seed was definitely dependent on the development of the embryo and poor germination might be due to disturbances in development caused by qualitative disharmony of the parental genoms, a disturbance of the numerical chromosome relation between nucellus, endosperm and embryo or plasmatic differences between the maternal tissues and the embryo. Pollination of the three-species hybrid and two-species hybrids with the doubled chromosome number with *N. paniculata* caused the development of apomictic embryos with the maternal diploid chromosome number.

1024. GENTSCHKEFF, G. 633.71:581.45:575.113.42.061.1
(Genetic study on *Nicotiana Tabacum* L. III. The shape of the leaf base).
Annu. Univ. Sofia 1935/36 : 14 : Fac. Agron. Sylvicult. Livre I.-Agron. : 189-208.

The inheritance of the shape of the leaf base was studied in F_1 , F_2 and F_3 in the crosses *sanguinea* (petiolate) x *Babura* (sessile), *angustifolia* (petiolate) x *alba* (sessile) and *macrophylla* (sessile) x *angustifolia*. The petiolate condition was dominant in F_1 , but to a different degree in different crosses. The segregations in F_2 and F_3 were in accordance with the hypothesis that three polymeric genes were concerned.

OIL PLANTS 633.85

1025. *PLAČEK, E. M. 633.854.78:575
(Sunflower breeding).
Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 8 : 12-22.

Resistance to moth (*Homoeosoma nebulella*) in the sunflower depends on the presence in the tissue of the receptacle of a protective layer of special cells and behaves as a simple dominant.

* An extended summary of this paper is on file at the Bureau.

Highly resistant forms of sunflower have been obtained, but unceasing selection is necessary since segregation occurs. The same applies to resistance to *Orobanche*, which is also dominant. The performance of many useful varieties, obtained by this method, in variety trials is described with particulars of many new varieties bred in the same way.

Immune forms, in contrast to susceptible types, have on their roots characteristic swellings which proved to consist of proliferated cortical tissue and lignified cells around the dying, invading shoots of *Orobanche*. Physiologically this immunity proved to be dependent on the active acidity of the cell sap of the root system; and instances of apparent loss of immunity when a variety was transferred to a new district were found to be due to the existence of a new physiological race of the parasite, termed race B, to distinguish it from race A which is much less virulent. Varieties resistant to race B have, however, now been evolved. The possibility of using resistant varieties as a method of clearing soils infected with *Orobanche* is suggested and also a method of distinguishing types resistant to race B by the reaction of their seed to an alkaline solution and thus avoiding the necessity for artificial infection in the nursery.

To eliminate the difficulties due to segregation inbreeding is recommended from which good results both as regards low husk content and high oil content, as well as the production of constant forms resistant to moth and *Orobanche* and to diseases such as rust and *Sclerotinia*, have been obtained.

The advantages of a thorough study of the genetic characters of the sunflower by inbreeding and a few preliminary findings concerning the dominance of certain characters are given. A number of families homozygous for the protective layer character have been established and are not only completely immune to moth and race A of *Orobanche* but in some cases are also highly resistant to drought (line No. 111), while others have a high oil content and a low husk content (line No. 144). Many are resistant to rust, verticilliosis and other fungous diseases. Two families Nos. 140 and 137 are equal to the standard variety No. 169, though slightly inferior in oil content.

Constant inbred families have also been studied by diallel crosses since 1933 and the best combinations, the varying degree of heterosis depending on the pairs of families chosen for combination and the appearance in the later hybrid generations of new forms in no way inferior to the first generation as regards quantitative characters have been noted.

Though individual family selection has its uses, hybridization is the most effective method of producing high yielding and economically valuable varieties.

A diagrammatic programme for sunflower breeding is included in the article.

1026. ŠEVČENKO, Z. D. 633.854.78:576.312.35:576.356.5
(**The karyological investigation of the genus *Helianthus***).
Seleksija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 9 :
p. 90.

The chromosome numbers found by previous workers are recorded with a list of the diploid numbers for 16 species of perennial sunflowers as determined by the Saratov Plant Breeding Experiment Station. The figures represent a polyploid series with the basic number 17 ($2n = 34, 68$ and 102) with one exception namely *H. atrorubens*, which had $2n = 28$. It is suggested that in view of the marked deviation of the latter species from the rest as regards its inflorescence and other important characters, it might well be removed from the genus *Helianthus*.

Further cytological and genetic investigations may elucidate the inter-relations between *Helianthus* species and between the genus itself and other related genera.

CAMPHOR PLANTS 633.956

1027. GOLOUBINSKI, I. N. 633.956:576.354.4
(**Embryological analysis of the development of the male gametophyte of *Ocimum canum***).
Sovetskaja Botanika (Soviet Botany) 1936 : No. 3 : 49-60.

Studies were made on pollen development in this new plant which has received much attention recently as a valuable source of camphor. At microsporogenesis 35-36 apparent bivalents

were observed, which in view of the diploid chromosome number 64 indicates the presence of a certain number of univalents. Various other irregularities of meiosis and tetrad formation were also observed in varying degrees in different individuals, giving rise to irregularities such as multinuclear, dwarf or giant pollen grains and leading to varying degrees of pollen sterility. These irregularities are thought to be partly associated with the unfavourable environmental conditions for a plant introduced from the tropics.

FRUIT TREES 634

1028. PICKETT, B. S. 634:575
Science and the future of pomology.
 Virginia Fruit 1937 : 25 : 108-19.

Two applications of scientific methods to fruit breeding mentioned in this popular account are the discovery that triploid apples are useless for breeding and the development of a method for growing embryos of cherries and peaches in artificial culture, which may be of service in wide crosses.

1029. LANTZ, H. L. 634:575(73)
Fruit breeding and new varieties.
 Virginia Fruit 1937 : 25 : 51-59.

A brief survey of fruit breeding in the U.S.A., with special attention to apples. Peaches, plums and raspberries are also mentioned. Recent hard winters have revealed the importance of winter-hardiness.

1030. TALBERT, T. J. 634:575(77.8)
Fruit varieties for Missouri.
 Bull. Missouri Agric. Exp. Sta. 1936 : No. 371 : Pp. 56.

Brief descriptions are given of the three methods of origin of new fruit varieties, chance seedlings, bud mutations (especially red sports) and hybridization, and also of the American plant patent law, which gives the patentee the exclusive rights in respect of the asexually propagated progeny. Then after remarks on different topics affecting choice of varieties descriptive lists are given of varieties, recommended for Missouri, of apples, pears, quinces, peaches, nectarines, apricots, cherries, plums, grapes, strawberries, blackberries, raspberries, gooseberries and black, white and red currants.

1031. KESSELRING, W. 634:575.127
 Zur Züchtung neuer Obstsorten durch J. W. Mitschurin. Ergebnisse sechzigjähriger Arbeit (1874 bis 1934).
[Breeding of new fruit varieties by I. V. Michurin. Results of sixty years' work (1874 to 1934)].
 Obst- u. Gemüseb. 1936 : 82 : 67-71.

A survey is given of the contents of the recent book by I. V. Michurin (Cf. "Plant Breeding Abstracts", Vol. VII, p. 122). The achievements of this famous Russian fruit breeder are referred to in highly appreciative terms, though it is pointed out that some of his scientific principles require further investigation.

1032. ODINTSOV, V. A. 634:575.127
(One year without Michurin—along his path).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods.
 Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 :
 No. 3 : 15-22.

Since Michurin's death, tests of his varieties have been made at 550 different places in the Soviet Union. A large collection of rootstocks has been made from which to select the most suitable; moreover most of the new varieties are found to thrive equally well on their own roots. An examination of the local populations of fruit trees has revealed the existence of a number of valuable characters which will be of use in breeding. An organized breeding programme, based on Michurin's methods, has been arranged. Promising hybrids have been obtained by

crossing the American cherries and plums with the European and local varieties, or the local *Prunus ussuriensis* with the Finnish pears, and several new pears resistant to the severe conditions of the north, including the variety Tungus, have been produced by Michurin's methods.

1033. SLUDSKII, N. 634:575.127
(The theoretical importance of the works of I. V. Michurin in breeding and genetics).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 : No. 3 : 35-38.

Michurin's work has shewn that a hybrid in its first generation is susceptible to a number of external influences, including that from grafting and his work further indicates that some of these influences are transmitted also to the progeny. It is pointed out that the products of metabolism of the scion species are different from those of the stock species and when these are transferred from one to the other they may alter the metabolic processes occurring in the cells of the stock, and consequently the character of the resulting organism, in the direction of the scion. The reverse influence of the stock on the scion may also take place and both are classed by Michurin as "mentor" effects. The most marked effects have been observed in connexion with the vegetative period. The method of "vegetative *rapprochement*" depends upon the same principle.

Many of Michurin's hybrids when reproduced vegetatively give only small fruits but give quite large fruits when reproduced from seed.

1034. TSVEIGEL'T, F. 634:575.127
(New problems in breeding fruit varieties).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 : No. 3 : 84-87.

An appreciation of Michurin's work, some of which has been confirmed by the author in Austria. Many of the Michurin hybrids are being introduced for trial in the Steyermark.

1035. YAKOVLEV, P. N. 634:575.127
(For the revolutionary teachings of the late I. V. Michurin—against the conservatives).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 : No. 3 : 23-34.

The author makes a vigorous defence of Michurin's work against certain authors who have denied or under-estimated its value. The defence is sometimes made at the expense of accepted genetical theory.

1036. BERKUT, O. D. 634:575.127:581.331.2
(An experiment on applying the late I. V. Michurin's method of mixing pollen in hybridizing).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 : No. 3 : 63-71.

Michurin found that in many of his most difficult crosses an admixture of a small amount of pollen of the maternal species to that of the pollen species definitely improved the results, evidently supplying the necessary stimulus to the stigma, and subsequently he used mixtures of pollen of several different species with equally great success.

Experiments to test the efficacy of the method are here reported. Pollinations of the same mother plant were made with three different pollen varieties and the results compared with those obtained from a mixture of the pollen of all three. Thus with a sour cherry pollinated by three varieties of plum a set of 2 per cent was obtained from the mixed pollen as compared with sets varying from 0 to 1.6 per cent for the pollinations with the individual varieties.

With a different group of three plum varieties a set of 5.3 per cent as opposed to 0.43 per cent and with a third group 3.2 as opposed to 0.04 per cent were obtained. In all 3,477 flowers were pollinated and the average set amounted to 1 per cent.

In experiments with *Prunus spinosa* pollinated with plum and myrobalan an average set of 3.6 per cent was obtained from 1,926 flowers, whereas with mixed pollen sets as high as 12.6 per cent were obtained; similar results were obtained in pollinating an apple with different apple varieties.

The styles of an apple pollinated with mixed pollen from three different varieties of pear were examined cytologically and compared with the single pollinations. The maximum pollen germination was clearly obtained with the mixed pollination and the same was observed in a pear pollinated by four apple varieties, where a 100 per cent germination was obtained, with a set of 10.1 per cent. By a slight admixture of maternal pollen this was increased to 13.9 per cent. Similarly with hawthorn pollinated by three varieties of apple, with the mixed pollen a germination of 58.1 per cent and a set of 7.4 was obtained, compared with an average set of 1.8 per cent. It is recommended that mixtures of still larger numbers of varieties, e.g. up to five or even ten, should normally be used. When pollen of the maternal species is added it should be from a variety that is sterile with the maternal variety.

There are indications from the results that the younger hybrids gave better results in distant hybridizations than older trees.

1037. SHAMEL, A. D. and POMEROY, C. S.

634:575.252

Bud mutations in horticultural crops.

J. Hered. 1936 : 27 : 487-94.

A general survey in which it is emphasized that bud mutations are more frequent than has often been said, both in citrus and in other fruits. Tables are given classifying 2,761 cases in fruits, domestic and sweet potatoes and in the walnut. Bud mutations are of considerable value in the development of new varieties and may become even more important if more extensive and systematic search for them is performed and possibly also by the use of X-rays. A promising sport should be given a progeny test and a commercial test on a reasonably large acreage before introduction.

1038. KEMMER, E. and SCHULZ, F.

634.1-1.541.11:575:576.356.5

Ueber die Bedeutung des Kernobstsämlings als Unterlage. (The importance of pome fruit seedlings as rootstocks).

Obst- u. Gemüseb. 1936 : 82 : 86-87.

Observations have been made on the first year development of seedlings of eighteen diploid and eleven triploid apples and nine diploid and four triploid pears, in respect of their suitability for use as rootstocks. The triploids were inferior in number of seeds per fruit and in germinating capacity, and also in vigour and especially quality of the young seedlings and are regarded as worthless for stocks. In the diploid apples the varieties Weisser Wintertaffetapfel and Kleiner Langstiel gave the best seedlings and in the diploid pears Gellerts Butterbirne.

1039. ISAYEV, S. I.

634.11:575.127

[The late I. V. Michurin's apple varieties. (From the data of the All-Union investigating of I. V. Michurin varieties)].

Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 : No. 3 : 39-50.

Observations have been made on 13,392 trees of Michurin's varieties growing in 549 different places in the U.S.S.R. Data are here given on their yield: the best in this respect was the variety Pippin Crab and various others are noted as having given good yields. In time of coming into bearing, Slaajanka and Saffron Pippin were the earliest (coming into bearing at the age of 4.7 years); the extreme early bearing of the variety Taežnoe, bearing in the second year, is inherited from its *Malus baccata* parent and other combinations too shewed early bearing to be a dominant character. Most varieties were frost resistant to a certain degree, the hardiest of all being Taežnoe, Golden Crab, Ermak and Dessert Crab; it is significant

that the first of these has *M. baccata*, the second and third *M. prunifolia* as one of their parents. More than half the Michurin varieties proved resistant to scab (*Fusicladium dendriticum*), resistance being dominant in inheritance, as seen by a number of hybrids of the susceptible variety Antonovka with resistant varieties.

There was also some relationship between the size of fruit of the hybrids and of their parent varieties. The same was true as regards flavour, the best hybrids being those with one high quality southern variety as parent, whilst the hybrids of *M. baccata* were the lowest in quality. Most of the hybrids are good keepers, keeping for 135–215 days, keeping capacity behaving also as a dominant character.

1040. 634.11:575.183

Bos, J. 634.13:575.183

Over den invloed van het stuifmeel op de eigenschappen van vruchten.

(On the influence of pollen upon the fruit characteristics).

Fruiteelt 1937 : 27 : 8–11.

The arguments for and against the possible occurrence of metaxenia are briefly stated and evidence is then quoted to shew that the seed, and therefore the pollen too, may exercise an influence upon the fruit characters. (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 240, and Vol. VII, Abst. 67.)

1041. 634.11:577.16:575

MANVILLE, I. A.
New developments in nutritional value of apples as the result of
research and clinical experience.

Bett. Fruit 1936 : 31 : No. 5 : 3–5, 16–18.

In discussing the vitamin C content of apples it is suggested that gene activity is of more importance than chromosome number, and that the tendency for triploids to shew higher values may be due to cumulative action of the genes concerned.

Data are given on the vitamin A and vitamin C contents of a number of varieties and also on the uronic acid content, a substance whose dietetic properties resemble in certain respects those of vitamin A.

1042. 634.11:577.16:575.11

BREGGER, M. P. and BREGGER, J. T. 634.23:577.16:575.11

Vitamin and other nutritional values in apple varieties.

Virginia Fruit 1937 : 25 : 147–60.

In this survey it is stated that the late Duke cherry has a vitamin A potency intermediate between that of Royal Ann and Montmorency, typical representatives of the sweet and sour cherries respectively, late Duke being a hybrid between sweet and sour cherries. Again, the vitamin C potency of the Cortland apple is intermediate between that of its parents, McIntosh and Ben Davis.

The connection between vitamin C content and chromosome number is also mentioned.

1043. 634.2:575(47)

KOVALEV, N. V.
(The wild species of the genus *Prunus* s.l. in North America and
their role in the plant breeding of the U.S.S.R.).

Bull. Appl. Bot. Leningrad 1936 : Ser. VIII (5) : 143–58.

In order to ascertain which species of *Prunus* should be most suitable for the U.S.S.R. and in particular Siberia and the arid regions of the South East, taxonomic particulars and descriptions have been collected from literature on *Prunus* and from observations on specimens at the Institute of Plant Industry, Leningrad. Incidental comments on crossability, hybridization work in U.S.A., U.S.S.R. and elsewhere and on the frost or drought resistance of some of the hybrids are given.

Similar notes on *Cerasus*, *Amygdalus*, *Persica* and other genera are given.

The study is regarded as a preliminary to breeding operations. (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 991.)

1044. KHASAN-YENIKEYEV. 634.21:575.127.2(47)
(I. V. Michurin's apricot varieties).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods.
 Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 :
 No. 3 : 51-62.

Michurin was able to produce a number of hardy apricots capable of growing in northern regions by using the hardy Manchurian apricot, *Armeniaca mandshurica* Koehne as one parent in all his crosses. A description is given of this species, which is capable of tolerating temperatures of -40°C . The fruits are very aromatic and occasional forms have been found with large fruits that are edible.

Many of Michurin's hybrids seem to be natural hybrids between *A. mandshurica* and wild plants of the common apricot, *A. vulgaris*, and are in consequence very variable in form, sugar content, etc., though in certain characters, such as their hardiness, their habit of flowering before the leaves emerge, the pubescent ovary and smooth stone, they resemble the Manchurian apricot. Their general characteristics are described. Their fruits vary in size from 8.6 to 16.7 grm., being 3-4 times the size of the Manchurian apricot; two out of 28 seedlings had fruit classed as of good quality, but most of them had a high sugar content, their main defects being the small fruit and large seed. They make excellent preserves however.

The highest yield was given by the hybrid named Tovarišč, giving 14.4 kg. of fruit per tree; this and certain others of the hybrids are rather susceptible to *Clasterosporium carpophilum*, though some of the other hybrids are immune. Tovarišč comes into bearing in the sixth year and is extremely hardy, being undamaged by temperatures of -39°C . in 1928-29. In view of these valuable qualities these varieties will be useful parents in breeding work, whereby it is hoped also to improve the quality and size of fruit of the hybrids themselves. The chromosome numbers of those hybrids examined cytologically, and of their hybrids with southern varieties, were $2n = 16$.

1045. VEH, R. VON 634.23:581.143:578.08
 Die Anzucht von Kirschsämlingen aus frischgeerntetem Saatgut. (**Raising cherry seedlings from freshly collected seed**).
 Züchter 1936 : 8 : 305-12.

Tests with cherries made on the same lines as previous experiments (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 275) shewed that, in general, the normal cherry embryo is ready for germination at any time, the process being prevented only by the presence of the integuments and the nucellus in particular. The effects of prolonged desiccation could be counteracted by steeping embryos in water whereupon development proceeded in the normal way.

1046. BLAKE, M. A. and CONNORS, C. H. 634.25:575(74.9)
 634.25:575.11

Early results of peach breeding in New Jersey.

Bull. N.J. Agric. Exp. Sta. 1936 : No. 599 : Pp. 32.

The first crosses and selfings in the breeding work on peaches by the New Jersey Agricultural Experiment Station were made at Vineland in 1914. Further breeding was carried out in 1915 and 1916 and 1,952 seedling trees were produced.

Data are given on the transmission of a number of economic characters by the varieties involved. White flesh is dominant over yellow and appears to be due to a single factor, which also affects the colour of the foliage and the inside of the calyx cup. A single factor also appears to be involved in the inheritance of glands; the homozygotes have reniform glands or are glandless while the heterozygote has globose glands. The following characters were found to be dominant; red flesh colour about the pit, non-melting flesh (and also watery-melting over firm-melting), blood-red flush, heavy pubescence, standard tree size in J. H. Hale crosses and early blooming. Round fruits were recessive in inheritance. Data are also given on the production of sterile seedlings in different crosses.

The rest of the bulletin is devoted to descriptions of valuable new forms selected from these crosses, 17 of them first generation seedlings and one a second generation, obtained by open pollination of an Elberta x Greensboro hybrid.

CITRUS FRUITS 634.3

1047. 634.3:576.16(52)
634.3:575.12
634.322:576.16:581.6
TANAKA, T.

(On the origin and the future of Japanese citrus flora).

Studia Citrol. 1936 : 7 : 155-75.

TANAKA, Y. and YAMASHITA, T.

(Investigations on the character of Satsuma orange varieties).

Studia Citrol. 1936 : 7 : 190-207.

In the first of these papers the history and nomenclature of a large number of citrus species in Japan are dealt with and the investigation of the numerous miscellaneous species that have appeared of recent years is urged as well as the collection of all the fundamental species and the various types of the loose-skin oranges. From such material new species could be produced by natural or artificial hybridization.

The second paper records the differences found to exist in various strains of varieties of the Satsuma orange *Citrus unshiu* Marc. in regard to certain economic qualities such as the optimum period of palatability and the sugar content.

1048. 634.3-1.524.4
634.3:576.16
KOJIN, A. E.

(The origin of citrus cultures and the modern centres of their diversity).

Priroda (Nature) 1936 : No. 8 : 29-40.

An outline is given of the present knowledge concerning the origin of the different groups of citrus fruits and their introduction into cultivation with interesting remarks on the origin of their names.

India and China are the primary centres of origin of the main citrus groups and constitute the areas of greatest diversity. In India there occur many forms unknown in other citrus countries, especially of the mandarin group. This group is also very abundant in China; and Indo-China and the Malay Archipelago constitute the centre of the *C. nobilis* group, kumquats and the sweet orange (Annam). The Chinese forms are especially important for breeding on account of their resistance to frost and to fungous diseases.

Citrus plants spread from these areas at an early date and secondary centres of diversity have developed in Japan, the Near East and the Mediterranean. The Japanese group, including the Satsuma, is also of interest for its hardiness and the same applies to the Iran group, which is very rich in forms. The sweet orange has attained its maximum diversity in the Mediterranean and further sources of variation are now developing in the new citrus areas.

The lemon is thought to be not a wild form at all but a mutant of the Indian citron (*Citrus medica* L.). Similarly the grape-fruit is thought to be probably a mutant of the shaddock, possibly occurring in India, where therefore other similar forms may possibly be found.

1049. 634.3-2.111-1.521.6:575
GLOBA-MIKHAILENKO, N.
(The selection of frost resistant citrus trees in foreign countries).
Soviet Subtropics 1936 : No. 11 (27) : 93-97.

Information on the work in progress in a number of institutions abroad was obtained by means of a questionnaire. Frost resistant hybrids were obtained by A. Bernard in 1894 from crosses of the sweet orange (*C. aurantium*) with *Poncirus trifoliata*; all the hybrids had thorns and resembled *P. trifoliata* to varying degrees in leaf shape, and in two of the hybrids the leaves were deciduous and in one they were aromatic like *C. bigaradia*.

The fruits were intermediate in size but non-edible, containing very little flesh and quantities of seeds. Some hybrids have withstood frost of -12°C . and more, and they were still more hardy when grafted on to *P. trifoliata*. When the tree reached a height of about 1 m. some suitable fruiting type such as Satsuma or kumquat, etc., was grafted on to it.

Similar hybrids were made by Conderc between *P. trifoliata* and *C. bigaradia*, Satsuma and the hardy Spanish San Jeronimo lemon; the hybrid trees withstood frosts of -14°C . and the fruits -7°C .

In the U.S.A. attention is given to Meyer's Chinese lemon, to *C. ichangensis* and the citranges in connexion with the production of hardy forms and some of the hybrids already obtained promise to be of value for cultivation in the U.S.S.R.

1050. SCHAFFNER, J. H. 634.38:577.84
Offspring of a self-pollinated reversed carpellate plant of *Morus alba*.
 Bot. Gaz. 1936 : 98 : 425-28.

The various progeny from a self-pollinated tree of *Morus alba* that had become carpellate by sex reversal was observed for a number of years and found to comprise pure male, pure female individuals and also some monoecious individuals. A consideration of these and similar results previously recorded of sex reversal from the male to female type lead to the conclusion that both males and females in *Morus* are potentially bisexual and that dioecism in this tree is sexual expression conditioned not by hereditary differential factors but by physiological or physico-chemical processes. The frequency of sex reversal in both young and old specimens supports this view.

Observations covering more than one reproductive period and also the possible extremes of ecological environment are essential in sex reaction studies of a species.

VARIOUS SMALL FRUITS 634.4

1051. KOROLEV, A. N. 634.42:581.162
(The biology of the Feijoa blossoming).
 Soviet Subtropics 1936 : No. 11 (27) : 68-70.

The floral biology of the pineapple guava (*Feijoa Sellowiana*) is briefly described. Emasculation was carried out on 600 flowers, of which 200 were left unpollinated, 200 were artificially self-pollinated and 200 were pollinated with pollen of tree No. 111, a very prolific fruiter. The unpollinated flowers fell after 20 days, shewing that no parthenocarpy occurred. Cross-pollinated fruits were slightly larger than those from free pollination and distinctly larger than selfed fruits. The latter also contained much fewer seeds, though even in the crossed fruits the number of seeds varied with the pollen parent. Pollination in nature is effected by bees.

NUTS 634.5

1052. SKOROBAGATYI, A. 634.51:575(47)
(The outlook of walnut breeding and the extension of its cultivation into the Ukraine and analogous regions of the R.S.F.S.R.).
 Bull. Appl. Bot. Leningrad 1936 : Ser. VIII (5) : 135-41.

Walnut cultivation in various regions is mentioned and it is suggested that any very frost-resistant specimens should be noted for future breeding work in the Kharkov region. Experimental work was begun in 1932 and certain varieties were found superior in yield of kernel and oil and in weight and size of the nut on the Anikeevsk estate, while at the Bokoven'kovsk Station lying more towards the east and south, material for the breeding of drought-resistant types might be discovered.

At the Kharkov Forestry Institute seedlings from the above-mentioned districts have been raised, the vigour and drought and frost resistance of the various forms are to be studied and breeding work in which available species from other regions and countries could be used should be possible. Constancy of fruit shape is suggested as a subject for investigation. At the Veselo-Bokoven'kovsk Dendrological Station the morphological features of 125 trees have been noted as a preliminary to investigations on late and early flowering forms; and similar comparative observations on various species of *Juglans* may ultimately be useful in the production of interspecific hybrids.

The future trend of investigation should be towards selection of cold and drought resistant forms (with due regard also to the quality and quantity of the yield) and towards the production of new forms by hybridization. Some existing types in the U.S.S.R. and in Europe and U.S.A. that might possibly be of use as breeding material are mentioned and work on walnut breeding in France, Germany, U.S.A., Canada and England is cited.

PALMACEOUS AND OTHER FRUITS 634.6

1053. 634.64:576.312.35:576.356.4
634.64:581.46:575.113.4.061.6
 YASUI, K.
(Genetics and chromosome number in *Punica*).
 Jap. J. Genet. 1936 : 12 : 321-23.
 Three factors *R*, *S* and *C* were found to be concerned in the inheritance of flower colour in *Punica granata* L. and *P. granata* var. *nana* Pers. (pomegranates). In the presence of *S* and *C*, *R* produces red, *S* in the presence of *C* produces salmon-pink and *C* by itself does not produce any colour.
 Meiosis was normal, eight bivalents occurring in both these forms.

1054. 634.64:581.162.3:576.356.5
 SCHLÖSSER, L.-A.
 Befruchtungsschwierigkeiten bei Autopolyploiden und ihre Überwindung.
(Overcoming the difficulties of fruit-setting in autopolyploids).
 Züchter 1936 : 8 : 295-301.
 From two species of wild tomato, *Lycopersicum cerasiforme* and *L. racemigerum* of proved homozygosity, tetraploid forms were obtained by the callus method. Attempts to obtain triploid plants by crossing diploids and tetraploids failed, direct and reciprocal crosses being equally unsuccessful. An examination of the osmotic value of the pollen grains shewed that this was much higher in the diploid than in the tetraploid grains. These differences were modified by growing the plants under suitable cultural conditions. Experiments on pollen tube growth indicated that the cross $4n \times 2n$ was likely to be the most successful and pollination with pollen from the treated plants resulted in 18 per cent success in this cross and 3-4 per cent in the reverse cross.
 The triploid nature of the resultant plants was cytologically proved. The author suggests that similar differences in osmotic value may be the cause of failure in other crosses between polyploids and that success may be obtained by appropriate treatment.

SMALL BUSH FRUITS 634.7

1055. 634.711-2.8-1.521.6:575
634.711-2.7-1.521.6
 RIETSEMA, I.
 De mozaiekziekte der frambozen. **(Mosaic disease of raspberries).**
 Fruittelt 1936 : 26 : 206-12.
 Though resistant varieties in Holland are unknown, certain varieties are less susceptible or less seriously damaged by infection than others.
 A large number of strains were selected by the writer from inbred (selfed) material represented by six families. On inbreeding these strains twice, forms were obtained that were homozygous for berry size and partly so for fruit colour. The character, plant height, was not, however, fixed and dwarfs occurred among the normals.
 Comparisons of seedlings obtained by selfings and by hybridization shewed "heterosis" in the hybrids and weak individuals in the selfed seedlings. Such differences may, in the author's opinion, be explained as due to segregation.
 Numerous strains were crossed and one combination of one of the two strains from the family H. Br. (Haagsche Bruine) crossed with a strain of the family 112 yielded very vigorous plants with very large fruits of a handsome red colour, easily plucked and of satisfactory flavour; and all, including the seedlings, were free from mosaic.
 For economic reasons crossing is recommended in preference to inbreeding as a means of obtaining good commercial plants; and productive types of good quality and free from mosaic are expected from the author's present experiments. In the course of his search for immune varieties interesting hybrids were obtained between *Rubus Kunzeanus* x *Idaeus* and *Phoenicolasius* x *Idaeus*. These hybrid "varieties", which had a particular flavour and colour, as well as differing from other varieties in the time of ripening, were practically immune to *Byturus*. They are specially suited for eating purposes, ripen in August and are high yielding. Crosses of the raspberry with the bramble or the black raspberry or *Rubus spectabilis* or *odoratus* or *illecebrosus* gave no seedlings of any value.

1056.

PRUSS, A. G.

634.741:575.127

634.741:576.312.35

(The June berry as initial material for plant breeding and the methods of its hybridization).

Bull. Appl. Bot. Leningrad 1936 : Ser. VIII (5) : 53-102.

In view of its vitamin content and other chemical properties, its cold resistance, its value as a stock for other fruit trees and the uses to which its fruit, wood and flowers can be put, the June berry (*Amelanchier* sp.) was studied from the following aspects:—(1) the biological and economic characteristics of the various species, including observations on the geographical distribution of the latter and a description of the genus; (2) the selection of useful types for subsequent breeding and mass cultivation; and (3) possible suitable methods of breeding.

Among the biological features studied were flowering, the time of greatest receptivity of the stigma, the influence of methods of emasculation and different types of isolators on the set of fruit and seed, self-pollination, parthenogenesis and apogamy, pollen germination and viability, pollinating agents and methods.

In the author's experiments a large number of intra- and interspecific and intergeneric crosses were made and a two-year study shewed that from intra- and interspecific crosses a set of from 0-83.3 per cent was obtained. *A. canadensis*, which is of particular interest owing to high sugar content of the fruit, when used as the female parent gave no set, though when used as the pollen parent it gave a set of from 11.5 to 83.3 per cent. As a rule intergeneric hybridization was also successful though with a considerably lower set. The cross between *Crataegus monogyna* ($2n = 34$) and *A. rotundifolia* ($2n = 68$) gave a set of from 4.7 to 24.1 per cent.

Among the crosses regarded as especially promising from the standpoint of fruit size and flavour are *A. ovalis* x *A. canadensis*, and *A. ovalis* x *A. alnifolia* and *A. spicata* x *A. canadensis* and *A. spicata* x *A. oligocarpa*.

In four species the diploid chromosome number is known to be 68; but further cytological and genetical data on the June berry and the relative value of the various species and varieties as parent forms has still to be acquired.

The remainder of this paper deals with the biochemical evaluation of the June berry, its technical utilization and cultivation in central and northern districts of the U.S.S.R.

1057.

LILIENFELD, F. A.

634.75:575.127.2:577.88

Karyologische und genetische Studien an *Fragaria* III. Geschlechtsverhältnisse in den F_2 und weiteren Folgegenerationen des Bastards zwischen der getrenntgeschlechtigen *F. elatior* und der zwittrigen *F. nipponica*. (Karyological and genetic studies on *Fragaria* III. Sex relationships in the F_2 and succeeding generations of the hybrid between the dioecious *F. elatior* and the hermaphrodite *F. nipponica*.)

Mem. Coll. Agric. Kyoto Imp. Univ. 1936 : No. 38 : Pp. 58.

In this third contribution (Cf. also "Plant Breeding Abstracts", Vol. IV, Abst. 254 and Vol. VII, Abst. 781) the inheritance of sex is studied, Correns's "realizator" theory being applied in the interpretation of the results; *F. elatior* is assigned the following constitution with respect to sex: $\text{♀ } v_e + v_e + e_1 + e_1 + e_2^a e_2^a \gamma$, $\text{♂ } v_e + v_e + e_1 + e_1 + e_2^a e_2^a$, *F. nipponica* being $v_n + v_n$.

The tetraploid F_1 from the cross *F. elatior* x *F. nipponica* consisted of about equal numbers of male and female plants, while the single pentaploid individual obtained from the reciprocal cross was male, with a slight tendency to seed-setting.

In the F_2 were to be expected $2\text{♀} : 1\text{♂} : 1\text{♀}$. Actually there was a shortage of hermaphrodites and an excess of males; this is attributed to the occurrence of sterility in plants with the sex-genotype of hermaphrodites, giving rise to so-called "false males", an hypothesis which was supported by other evidence. In the F_3 much better agreement with the expected ratios was obtained. It was to be expected that some of the F_2 females would carry only the γ -gene and others both the α - and γ -genes. From the F_3 results five could be shewn to have only the γ -gene and one other might have had both, but the number of progeny was too small for certainty.

Two hermaphrodites which were selfed proved self-fertile; since *F. nipponica* is self-sterile, this suggests that *F. elatior* had contributed a dominant gene for self-fertility. It could not be determined whether the chromosomes carrying the "realizators" and their indifferent allelomorphs paired exclusively allosyndetically or not. Indications were obtained of a balance between the "realizators" and the rest of the genotype and of the presence of modifying genes affecting the development of the pistil in male plants. The paper concludes with a discussion of sex distribution and determination in polyploid species.

1058. COLLINS, J. L.

634.774:575(96-9)

The evolution of pineapple culture in Hawaii.

Paradise of the Pacific, December 1935 : 70-77.

This account of the Hawaiian pineapple industry includes a brief account of the introduction of the plant, which is a native of Central or South America. The origin and exact time of introduction of the Cayenne variety are uncertain, though it is the most widely grown variety. The scientific work on the crop carried on by the Hawaiian Pineapple Packers Co-operative Association Experiment Station includes work on genetics and plant breeding. Studies of the inheritance of a rogue known as "collar-of-slips" furnished the basis for a method of the complete elimination of this type from the plantation fields. The two varieties grown commercially, Cayenne and Hilo, are both self-sterile and cross-sterile with each other and seedlings can only be produced by crosses with imported varieties, which are subjected to a stringent quarantine on entry into Hawaii. The seedlings, about 100,000 of which are produced each year, are very delicate and need careful treatment in the early stages. After about 15 months they are planted out and produce fruits after one and a half to two years in the field. They shew great diversity in many characters. Selected hybrids are multiplied vegetatively and are subjected to canning tests and then further multiplied, if satisfactory, for trial in the plantations.

1059. COLLINS, J. L.

634.774:576.16:575.11

Pineapple taxonomy viewed in the light of the genetics of the pineapple.

Proc. Hawaii. Acad. Sci. 1934 : Spec. Publ. 25 : p. 1.

In the hybrids between *Ananas comosus* (L.) Merr. and *A. microstachys* Lindl. the two characters anthocyanin in the leaves and leaf spines behave as though each were dependent on a single gene difference. Acid content, Brix and weight of fruit give a blending type of inheritance. It is considered that the genetical evidence is in favour of these two parent forms being considered as varieties rather than as species.

1060. COLLINS, J. L. and KERNS, K. R.

634.774:576.356.5:581.163

The origin and significance of triploid and tetraploid pineapples.

Proc. Hawaii. Acad. Sci. 10th Annu. Mtg 1935 : Spec. Publ. 26 : 10-11.

Triploid ($2n = 75$) plants occur in crosses involving the variety Cayenne with a frequency indicating that Cayenne produces about one diploid egg per thousand. Thirteen triploid clones have been established. The triploids are larger than the corresponding diploids and their cells have 40 per cent greater volume; they are highly sterile, though two produced fruits with an average weight two pounds greater than Cayenne.

By pollinating Cayenne with pollen from a triploid, tetraploids have been produced, apparently by the functioning of unreduced pollen grains. The tetraploids shew still greater increase in size and cell volume and are quite fertile.

It is suggested that seedless triploid forms could be produced by crossing tetraploids and diploids.

1061. STUMMER, A. 634.835:575
 Einige Ergebnisse der Rebenzüchtung. (**Some results of grape breeding**).
 Ber. Österr. Weinbaukongress 1935 : Hauptverband der Weinbautreibenden
 Österreichs, Wien 1936 : No. 16 : 112-18.

The author surveys both past and present grape breeding and mentions among other things that stock selection and clone breeding lead above all to valuable varieties in respect of yield and earliness. In the selection work it is striking "that many varieties are worthy of selection in so far as the stocks and the clones selected from them shew a large degree of variation in average yield." More important than selection is cross-breeding. The celebrated immunity researches of F. Zweigelt, notwithstanding the immense difficulties, are regarded by the author as the natural foundation for every crossing on an American basis. The important theoretical and practical question, whether all parts of a vine stock are equally valuable, is gone into. Navarro's idea "that each hybrid according to the length of the shoot forms different levels from which it is possible to read off as from a gauge the origin of the hybrids" is regarded as a fruitful suggestion. Immunity and quality can be combined. In this respect an interesting observation of Pirovano is mentioned. Wild flavour is dominant over improved flavour. Cross-pollination is more favourable than self-pollination even in the later years of life. Zweigelt and Steingruber are mainly responsible for establishing the effect of heterosis; in this respect the author also has produced some important new results. It is remarkable that in *vinifera* crosses certain varieties, e.g. Gutedel cannot be stimulated into new life by crossing. Good results have been obtained with Malingre whose important character for breeding is earliness. In flavour, however, it belongs to the most defective varieties. The size of the berries is important in dessert grapes. The author intends to publish with F. Frimmel a monographical study on the Malingre vine. Other points considered are muscat flavour, the electrogenetical researches of Pirovano, the work of Husfeld at Müncheberg, etc. A.B.

1062. VOBORIL, F. 634.835:575(43.6)
 Die Klosterneuburger Rebenzüchtung, ihr Stand und ein kurzer Überblick
 über einige erfolgversprechende Neuzüchtungen. (**The Klosterneuburger
 vine breeding, its position and a short survey of some promising
 new strains**).
 Weinland 1936 : 8 : 329-31.

Since 1920 crossing has been steadily carried out every year. At this time there are about 1,800 seedlings from selfings and crossings, in Krems about 1,500 seedlings and also 4,000 multiplications of the seedlings from Langenlois. An estimation of the seedlings is best undertaken 7-10 years after the crossing. The author then describes a whole series of successful hybrids which surpass their parents in valuable characters and no longer shew undesirable characters; he hopes that the Austrian vine grower will soon be able to obtain his own useful breeding varieties. A.B.

1063. MICHURIN, I. V. 634.835:575"793"(47)
 (Methods of shortening the period of vegetative growth with the new
 varieties of plants).
 Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull.
 Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1936 :
 No. 3 : 3-8.

It has often been observed that plants from seeds late in germinating were earliest in maturity and a vine hybrid is described which originated from the cross *Vitis labrusca* var. Champion x *V. amurensis*, which was three weeks later than other varieties in flowering yet produced good fruits larger in size than those of the other varieties. It is resistant to frost, mildew and phylloxera. Its only defect is the small size of the fruits and bunches.

1064.

Von der Ausleszüchtung. (Selection breeding).
Weinland 1936 : 8 : 252-53.

634.835:575.42

The limitation of the area for vine cultivation makes it specially necessary to cultivate only first class varieties. It is therefore important to choose the right type within a variety; it is not a matter of indifference which "Neuburger" or which "Weissburgunder", etc., are taken—the differences in yield and in quality are often considerable. Also the individual stocks are not of equivalent value and only those stocks should be used for propagation which are satisfactory in every way. In this respect good development of the wood must be considered in order to increase the yield of grapes. This must be done by selection breeding. Negative selection rejects those stocks which are proved bad year in and year out; positive selection puts better ones in their place. Annual notes of the best stocks and accurate continuous observation makes the choice more easy. Individual selection and clone breeding leads with certainty towards success. Clones tested for several years are recorded in the vine breeding register. A.B.

1065. NEGRUL, A. M.

634.835:577.8:575.1

Variabilität und Vererbung des Geschlechts bei der Rebe. (Variability
and inheritance of sex in vines).

Gartenbauwiss. 1936 : 10 : 215-31.

The literature on sex in vines is reviewed. Though most of the wild American species are dioecious, some of their cultivated forms and hybrids bear perfect flowers and such have also been observed among the Asiatic species and in considerable quantities among the wild grapes of the Near East, many of them being possibly the result of hybridization. Hermaphrodite flowers are common among the cultivated forms of *Vitis vinifera*.

The different types of flowers, normal and abnormal, encountered in grape vines are described and illustrated. There are no clearly defined divisions between the types and intermediate forms are frequent; the hermaphrodite and male forms are closely allied and apparent male forms will occasionally bear fruits. A tendency towards maleness can occasionally, though more rarely, be observed in hermaphrodite forms and several cases of male flowers occurring in *V. vinifera* are cited. No certain case of female flowers occurring in the same inflorescence as hermaphrodite or male has been yet found.

The literature on the inheritance of sex in vines is reviewed and the data of a number of authors are tabulated. Crosses between ♀ and ♂ forms of wild species give ♀ and ♂ in the ratio 1 : 1. In *V. vinifera* the pollination of ♀ by ♂ gives ♀ and ♂ in the ratio 1 : 1 and the pollination of ♂ forms *inter se* gives only ♂ or ♀ and ♀ in the ratio 3 : 1. The female sex is regarded as homogametic (*ff*) and the male heterogametic (*Ff*), the hermaphrodite resulting from a mutation in the *F* chromosome whereby the dominant genes are converted into lower allelomorphs. Such a chromosome is styled F_n and hermaphrodites can arise either from F_nF_n or F_nf . The former give only hermaphrodites on selfing, the latter 3 ♂ : 1 ♀. Varieties apparently of the formula F_nF_n are Riesling, Traminer, Black Manukka, etc., those with F_nf are Gutedel, Laska, Burgunder, Portugieser, Sylvaner, Muscat Alexander, etc. All the hybrids of the former type are hermaphrodite. In the F_2 of Riesling (F_nF_n) x Sylvaner (F_nf) there also appeared 1 ♀ : 3 ♂ as expected.

When these forms are crossed with male forms of other species (*Ff*) the former group (F_nF_n) gives 1 ♂ (F_nF) : 1 ♀ (F_nf), the latter (F_nf) gives ♀ (*ff*) + ♂ (F_nf) + ♂ (*Ff*) + ♂ (F_nF), the new form F_nF being male on account of the dominance of the factors in the *F* chromosome. The data of a number of authors are tabulated and are seen to agree with this interpretation, although there is frequently an excess of ♂ and frequent intersexual forms occur.

In crosses of *V. rupestris* ♀ (*ff*) with *V. vinifera* ♂ (F_nf) there was an absence of male forms.

In certain interspecific crosses between hermaphrodites there was an unexpected appearance of male forms. This and the occurrence of hermaphrodite forms in crosses between ♂ and ♀ species of the subgenus *Muscadinia*, from some of which later male forms were also obtained, is thought to indicate a change of the genes in the *F* chromosome as a result of interspecific crossing, either by mutation or by the influence of the autosomal genes.

For practical purposes, in order to obtain hermaphrodite races, forms of *V. vinifera* of the formula F_nF_n should always be used as parents.

1066. MERSCHANIAN, A. 634.835-2.411.4-1.521.6:581.45
Anatomisches Verfahren der Bestimmung der Widerstandsfähigkeit von
Rebblättern gegen die *Peronospora*. (**Anatomical methods for the
determination of resistance of vine leaves to *Peronospora***).
Weinland 1936 : 8 : 144-47.

On the basis of three years' anatomical investigations of the outer membrane of different varieties of vine and the study of their resistance to *Plasmopara viticola* B. et de T., the author comes to the following conclusion: the cuticle of the epidermis of the under side of the leaf is, in most varieties of vine and especially of the American varieties, thickened by folds which are found near the stomata and which extend out in fascicles on every side. For the development of the folds the following are of the greatest importance, the variety, the age of the leaf, dryness of the air, sunshine, etc. The more numerous are the folds of the cuticle the more it is resistant to *Peronospora*. In this respect the American varieties *Riparia Gloire*, *Solonis* x *Riparia* No. 1616 and *Riparia* x *Rupestris* 101/14, etc., are specially noteworthy. Dry air and strong sunlight increase both resistance to *Peronospora* and the formation of folds. The cuticle folds are strongly developed even in the seedlings which are only slightly susceptible to *Peronospora* so that this anatomical method can be used in vine selection for the determination of resistance to *Peronospora*. A. B.

1067. HARTMANN, H. 634.872:575
Rebenzüchtung im Dienste der Tafeltraubenkultur. (**Vine breeding in
the service of the cultivation of dessert grapes**).
Weinland 1936 : 8 : 222-25.

Vine breeding is of even greater importance for dessert grapes than for grapes for wine, as the cultivation of dessert grapes is of more recent date. In this respect it is rather a question of the breeding of new varieties than of the improvement of the old. That does not, however, mean that improvement should be neglected. By means of individual selection it is possible in a short time to make considerable progress and get rid of many bad points, etc. By such selection the much feared degeneration can be counteracted. The different value of the buds for propagation is not unimportant. Special problems are among others, increase in fruitfulness, e.g. Weissen and Roten Gutedel; increase in the size of the bunches, e.g. in the Bouvier-Traube, size of berries, e.g. in Muskat St-Laurent and Muskat Courtiller, earliness, e.g. in Gutedel, resistance to disease and defects in Frühroten Veltliner, Blauen and Grauen Portugiese, etc. With regard to the breeding of the new varieties the author mentions among other things the need for very early red and blue varieties. The Austrian Bundesanstalt für Rebenzüchtung, under the direction of F. Zweigelt, has for many years been successfully engaged in the breeding of dessert grapes. The author himself has been occupied since 1925 with selection and hybridization of dessert grapes. The Bundesrebenzüchtungsstation has been testing the value and possibilities for cultivation of newly imported foreign varieties. In conclusion the author suggests the creation of a kind of international central organization for the scientific needs of dessert grape culture with its seat in Austria. A. B.

FORESTRY 634.9

1068. GOIDÀNICH, G. 634.972.8-2.484-1.521.6:575
Comportamento dell' "*Ulmus pumila*" L. nella pratica agricola e la sua
resistenza alla grafiosi. (**The behaviour of "*U. pumila*" L. in practical
agriculture and its resistance to *Graphium***).
Boll. Staz. Pat. Veg. Roma 1936 : 16 : N.S. 199-207.

Two examples of *U. pumila* attacked by Dutch Elm disease are described. One was from a tree grafted on to *U. campestris* and the other (of which only the leafless branch was seen by the author), though like *U. pumila* in many respects, might have been a hybrid with *U. campestris*.

Attention is drawn to the danger of hybridization with susceptible species.

1069. LOZOWSKY, T. A. 634.973:581.162:575
 (The peculiarities of biology and production of the mountain
 ash as a fruit tree, in connexion with breeding and variety
 testing).

Bull. Appl. Bot. Leningrad 1936 : Ser VIII (5) : 3-51.

A brief note on the history and various uses of the rowan tree and its fruit is followed by a description of its systematic and biological characteristics, while the chromosome numbers of forms investigated by the writer or other workers are recorded with some data on the cytology and genetic origin of certain hybrids.

The present investigation was concerned with (1) the economic and biological features of the rowan as a fruit tree; (2) hybridization and the selection of material for breeding high quality fruit trees; and (3) varietal tests with a view to the selection of sweet varieties. Full descriptions are given of the species and the methods used.

Data are presented on the percentage set of seed, leaf variation in *Sorbus* species, seasonal formation of fruit buds, flowering, apogamy and pathenocarpy, the time of fertilization, protogyny, length of period of receptivity of the stigma, pollinating agents, rate of germination of pollen under natural and artificial conditions and its fertility, self and cross-fertilization and hybridization.

Certain species proved to be self-sterile and certain artificial crosses gave no set of fruit or seed e.g. *S. serotina* x *S. aria magnifica* and *S. Hostii* x *S. domestica*. Self-pollinated species, however, exist. The best pollinator for *S. aucuparia major* is *S. aucuparia* and for *S. hyb. quercoides*, *S. auc. major* and *S. Hostii*.

Using the ordinary method and Michurin's technique (in which secretion from the stigma of the pollinator is used to promote development of the pollen tubes of the latter), hybrid seedlings were obtained from 12 interspecific *Sorbus* crosses and from the intergeneric cross of the Finland Yellow Pear by *S. domestica*. The chromosome number of the pear and of *S. domestica* is given as $2n = 34$.

The aim of the above-mentioned crosses was to improve the flavour of the bitter fruits of *S. aucuparia* and *S. serotina* by crossing them with sweet species.

The leaf characters of a number of the hybrids proved intermediate, in other crosses the leaf type of the paternal parent was dominant.

Certain features of the leaf of the intergeneric hybrid as compared with the parent types are noted including the fact that the foliage stands a temperature of -6°C . The percentage set of seed was 0.02 and 0.01 in 1934 and 1935 respectively. The natural hybrid *S. auricularis* (*Pirus pollveria*) is stated to have $2n = 51$ chromosomes. Parthenocarpy was observed in the Finland Yellow Pear: apogamy was not.

The value of the various forms of *Sorbus* as breeding material for improved fruit quality is emphasized and the performance of a large number of imported rowans is mentioned with reference to winter-hardiness, yield and fruit quality.

A bibliography of four pages is added.

1070. ANDERSON, E. and WHELDEN, C. M. 634.973:581.162.32:575.125
 Studies in the genus *Fraxinus*. II. Data on the flowering and fruiting
 habits of three American species of ash of possible economic
 importance in the production of rapid-growing forest trees.
 J. Hered. 1936 : 27 : 473-74.

F. americana, the White Ash, *F. pennsylvanica*, the Red Ash, and *F. pennsylvanica* var. *lanceolata*, the Green Ash are strictly dioecious. Though they blossom irregularly they produce pollen with a fertility of 92 to 99 per cent and which can be stored for considerable periods with little apparent loss of viability. *F. quadrangulata*, the Blue Ash, a monoecious species produces barely one-third as much pollen per flower cluster.

It is considered that these properties favour the production of hybrid ash seed in quantity.

VEGETABLES 635

1071. HAGIWARA, T. and KAMIMURA, K. 635.61:575.11
Cross-breeding experiments in *Cucumis Melo*.
 Tokyo Horticultural School, Tokyo, October 1936 : Pp. 14.
 Data are given on the inheritance of the fruit characters: shape index, flesh colour, placenta colour, stripes, netting, epicarp colour and on seed coat colour.
1072. ESELTINE, G. P. VAN 635.62:575.127.2
Squash-pumpkin hybrids throw light on evolution of these forms. Results to date give promise of developing valuable new strains, particularly mosaic-resistant kinds.
 Fm Res. N.Y. St. Agric. Exp. Sta. 1936 : 2 : 6, 9.
 The successful crosses were (1) *Cucurbita moschata* var. Quaker Pie x *C. maxima* var. Banana; (2) *C. moschata* var. Japanese Pie x *C. Pepo* var. Golden Custard; (3) *C. moschata* var. Japanese Pie x *C. Pepo* var. Early Yellow Bush; (4) *C. moschata* var. Japanese Pie x *C. Pepo* var. Mammoth Yellow Bush Scallop and (5) *C. Pepo* var. Giant Summer Crookneck x *C. moschata* Japanese Pie.
 The fourth of these crosses gave an F_2 with a great variety of forms.
 The Japanese Pie variety of *C. moschata* appeared to transmit its resistance to mosaic to its progeny.
 A fuller account of the work is to be published elsewhere.
1073. 635.64:575.127.2:576.354.4:575.11
 AFIFY, A. 635.64:576.16
Some evolutionary aspects of a comparative cyto-genetic investigation between *Aconitum* and *Solanum*.
 Genetica 1936 : 18 : 255-76.
 The "*Solanum*" species concerned were *Lycopersicum esculentum* and *L. racemigerum*. A cytological study of the hybrid between these (Cf. "Plant Breeding Abstracts", Vol. IV, Abst. 1114) shewed them to be closely related; twelve bivalents are formed regularly at meiosis and the chiasma frequencies of the parents and hybrids are about the same. Moreover, meiosis in the tetraploid induced from the hybrid is similar to that in the ordinary tetraploid tomatoes.
 The segregation of a number of factors was studied in a cross between these two species and was found to be quite straightforward, except for certain deficiencies in the recessives: the linkage values for four linked factors were about the same in the hybrid as in the *esculentum* parent. Segregation was also noticed for characters which distinguish the species, dissection and crenation of the leaf and length of petiole, but it was impracticable to score them.
 It is concluded that the only factor in the differentiation of these species which can be inferred from the cytogenetic investigation is gene mutation.
1074. R. C. C. 635.64:576.356.52:575.148
A haploid marglobe tomato. Practical application of a "short cut" for making pure lines.
 J. Hered. 1936 : 27 : 433-35.
 In the cultures of Marglobe tomato raised by the Ferry-Morse Seed Breeding Institute a plant arose which from its external morphology and certain other features was indentified as a haploid. It set ten seeds and from these a line has been established which in view of its origin is claimed to be entirely homozygous. The progeny have, in fact, been very uniform, with the exception of three suspected haploids and one plant in the second normal generation with slightly smaller fruits.

1075. HAWTHORN, L. R. 635.64:581.163.036.1
Seedlessness in tomatoes.
 Science 1937 : 85 : p. 199.

The fruits of certain selections from a cross between the tomato varieties Large Cherry and Bonny Best set fruits containing seeds in June and early July, but become seedless in the higher temperatures of the middle of the summer. In November the fruits again contain seeds.

1076. LAMPRECHT, H. 635.652:575.127.2:632.111:575
 Rön och synpunkter vid förädling av köksväxter. (**Experiments and ideas on the breeding of vegetables**).
 Beretn. Nordisk JordbrForsker. Foren. 5th Kongr. København Juli 1935 :
 4-7 Hefte : 538-46.

Crosses were made between varieties of *Phaseolus vulgaris* and *P. multiflorus*. Hardiness was first measured by the germination capacity in the field compared with the laboratory, and differences were found between varieties of *P. vulgaris*. Varieties of *P. multiflorus* shewed much smaller differences. Crosses were only successful when *P. vulgaris* was used as the female parent. The few hybrid plants obtained were back-crossed with varieties of *P. vulgaris*. The back-cross hybrids were tested for frost resistance and a pronounced transgression in the direction of cold resistance was found among the progeny. If it should be possible to establish constant strains able to withstand temperatures of 5° C. sowings could be made much earlier.

1077. 635.652:575.42
Rambling observations of a roving gardner.
 Horticulture 1936 : 14 : p. 455, col. 1.

In a cursory note on the breeding of new varieties of flowers and vegetables it is stated that the "stringless string bean" arose from a single plant selection from a bean field in New York State.

1078. DANIEL, L. 635.652:581.162.3:575.1
 Croisement fortuit de deux races pures de haricots. (**The chance crossing of two pure lines of beans**).
 Rev. Hort. Paris 1937 : 109 : 396-99.

The substance of this paper has already been reviewed (see "Plant Breeding Abstracts", Vol. V, Abst. 1147 and Vol. VII, Abst. 813.).

1079. HANISCH, H. 635.656:575
 Beiträge zur Erbsenzüchtung. (**Contributions to the breeding of peas**).
 Verlautb. dtsch. Sekt. mähr. Landeskulturrat. 1936 : 37/13 : 75-77.

In many districts the cultivation of the garden pea has been made difficult by the appearance of the pea beetle (*Bruchus pisi*). After harvesting treatment with carbon disulphide of the seeds attacked, is strongly recommended. Whether the time of flowering has any influence on the attack by the beetle is still a debated point. The main aim is breeding for high yield and certainty of yield. Breeding for size of seed may be carried to extremes. The following are important: time of ripening, evenness and rapidity of growth. In Czechoslovakia the breeding of *Pisum sativum* has for long been successfully carried on. In this connexion the author mentions shortly the publication of Chmelař and Šimon (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 757) and others and then considers the special object of the breeding of peas for drying and for canning. For the latter the colour of the seeds plays a special part. Co-operation between the breeder and the canning industry is much to be desired. In conclusion the author mentions and describes his own work on pea breeding. A.B.

BOOK REVIEWS

WEBER, E.

519.24:575

Einführung in die Variations- und Erbliehkeits-Statistik. (**Introduction to the statistics of variation and inheritance**).

J. F. Lehmanns, München 1935: Unbound RM. 9.60, Bound RM. 11.†
Pp. 255. 27 figs. 94 tables.

The first part of this book consists of a general introduction to elementary statistical ideas. Beginning with one-variable problems, we have a study of frequency distributions, the calculation of means and standard deviations and their probable errors. The material is well illustrated with numerical examples. The use of a logarithmic scale for the variable is discussed. The fitting of the normal (Gaussian) curve to observational data comes next, and tables are given, while skewness in the case of asymmetrical data is defined. In the study of problems in two or more variables we are introduced to the correlation table, and calculations are given for the regression and correlation coefficients (total and partial), also the correlation ratio. The binomial result for two categories, or for a 2 x 2 classification in two variables, comes up for discussion in view of the applications to be made later.

The second part deals with statistical methods used in heredity studies. Theorems on probability are given, and applied in the law of great numbers and the binomial and Lexis theorems. The mean and dispersion criteria are developed and the binomial theorem further discussed in relation to Mendelian laws of heredity. The author then goes on to discuss human hereditary studies by alternative methods, winding up with the calculations involved in the blood group formulae.

The book does not add much to our knowledge of statistical methods, and is chiefly interesting because of its specialized applications to the study of heredity. Students of the latter will be grateful for the summary provided of much recent work.

J.W.

535.61-31

537.5

539.16

ZIMMER, K. G.

Strahlungen. Wesen, Erzeugung und Mechanismus der biologischen Wirkung. (**Radiations. Nature, production and mechanism of the biological effects**).

Georg Thieme, Leipzig 1937: RM. 3.20.† Pp. 72. 40 illus.

This book is the first of a series of some 50 small volumes with the general title of "Problems of theoretical and applied genetics and related topics". The aim of the volume before us is to give an account of the aspects of the physical nature and the biological effects of radiations by which the genetic results can be explained and understood. The author succeeds in giving a clear and concise account of the phenomena, a noteworthy achievement considering the limited space at his disposal and the fact that he abstains from the use of mathematics, with the object of making the book comprehensible to as wide a range of readers as possible. After a brief historical introduction and survey of the different types of radiations there follows an account of wave radiations including radio waves, light rays (infra-red, visible and ultra-violet), X-rays and gamma-rays. This is followed by a chapter on the corpuscular radiations, beta-rays, negatrons and positrons, alpha-rays and other rarer forms. Next comes a chapter on cosmic rays and then a general chapter on the biological effects of ionizing radiations. Chapters VI and VII are concerned with less well-established phenomena, mitogenetic rays and the so-called "earth rays" (Erdstrahlen), which have been postulated to explain the activities of water-diviners and similar quasi-psychic phenomena, and which are considered by some to have pathological influences on plants. The author displays a healthy scepticism in both these chapters, especially the latter. The final chapter is in the form of a short appendix, containing some remarks from the physical point of view on matters of technique in genetical experiments with radiations. A bibliography is provided giving references to books and reviews but not to original articles.

The book is to be recommended in that it fulfils admirably its expressed purpose.

† 25 per cent reduction outside Germany.

SIRKS, M. J. (Editor)

575:633:061.3

Congrès International de Sélectionneurs de Plantes. Pays Bas, 22-27 Juni, 1936. (**International Congress of Plant Breeders. Netherlands, 22-27th June, 1936**).

E. J. Brill, Leiden 1936: Vol. I, Pp. 140. Vol. II, Pp. 90. 7 figs.

The two volumes dealing with the International Congress of Plant Breeders, held in Holland in 1936, naturally are full of interest for plant breeders. The first volume contains reports sent from different countries on four topics, namely the general organization of plant breeding and the problems presented by wheat, potato and sugar beet breeding. The countries contributing such reports are Australia, Belgium, Czechoslovakia, Denmark, Germany, France, Great Britain, Greece, Italy, Holland, Austria, Poland, Switzerland, Finland, Sweden and Canada. Not every country, of course, contributes to each topic.

The second volume contains the actual report of proceedings of the congress, which included general papers and discussion on the four topics covered in the first volume. Other papers included in this volume consist of one by O. De Vries on the breeding of perennial crops in the Dutch East Indies, with special reference to *Hevea* and one by J. Jeswiet on sugar cane breeding in Java. Accounts are also given of the tours made during the course of the congress and a list of members.

All the reports are presented in French, German or English.

BENL, G.

575.1

Lehrbuch der Vererbungslehre. (**A textbook of genetics**).

Georg Thieme, Leipzig 1936: RM. 1.90.† Pp. v + 78. 79 illus.

In this introduction to the elements of genetics the idea of heredity is first summarized, followed by a brief outline of Mendelism and of cytology and its application to genetics. The inheritance of sex is dealt with in more detail and the problem of linkage, crossing-over, etc., and the theories of the origin of species are shortly mentioned.

The final chapter is devoted to inheritance in man.

LOUIS-MARIE.

575.1

Hérédité. Manuel de génétique. (**Heredity. Manual of genetics**).

Institut Agricole d'Oka, La Trappe, Quebec, Canada 1936: Pp. 473.

\$1.80. illus.

This manual claims to be probably the first textbook of elementary genetics written in French in America and it is intended for students of agriculture and medicine.

The book is divided into three parts, the first on the general principles of genetics, the second on their application and the third on eugenics. The manner of presentation is apt to be discursive and the choice of matter tends towards the sensational. Most of the illustrations are taken from the *Journal of Heredity*.

DARLINGTON, C. D.

576.312

Recent advances in cytology.

J. & A. Churchill, Ltd., London 1937: 2nd Ed.: 21s. 0d. Pp. xvi + 671.

160 figs. 16 pls. 78 tables.

The criticism, often quite violent, to which Dr Darlington's theories were subjected after the publication of the first edition of this book in 1932, has now diminished considerably. The criticism was possibly not unexpected, being usually encountered by those who seek to introduce plausible unifying principles into a subject in which such principles have been lacking. The test of the validity of new principles is not, however, the volume of criticism which they arouse, but how they withstand it and whether they are of use in further investigation. On both these scores the verdict of the four or five years since the first edition seems to be in favour of Dr Darlington. The conception of metaphase pairing at meiosis as due to chiasmata is now universally accepted as applicable to almost every organism and, since one of the chief American exponents of the "classical" theory of crossing-over has recently admitted that crossing-over is a condition of chiasma formation, the partial chiasmotypy

hypothesis might also be said to be universally accepted. These two theories have the important corollary for plant breeders that pairing at metaphase infers genetical crossing-over between the chromosomes concerned (*Drosophila* males provide an "exception which proves the rule"). The precocity theory relating meiosis to mitosis does not appear to have been so widely accepted, though evidence in its favour has been produced by various workers in different countries and it is a very useful conception for relating observations which would otherwise remain unconnected. The same might be said of the author's theories of chromosome movements, positions and attitudes, now termed "external mechanics of the chromosomes". Of the theories of "internal mechanics" (spiral structure and related topics) it is, we feel, too early to speak.

Essentially, the second edition differs from the first in having a different plan and in incorporating the advances made in the interim. It also includes some modifications of the author's ideas which have been occasioned by pertinent criticism or by new evidence (e.g. on the function of the nucleolus). The range of topics is very similar to that of the first edition (Cf. "Plant Breeding Abstracts", Vol. III, pp. 39-40). Instead, however, of the last chapter being devoted to the evolution of genetic systems, the whole account has been "recast in terms of evolution". One of the factors which has made this possible and which is brought out by the treatment, is the increase in our knowledge of genotypic control of genetic systems themselves. The last chapter is now devoted to cell mechanics, including among other interesting topics an account of the author's "Balance Theory of Mitosis" (Cf. Abst. 831). One of the features of this book, and one which makes it a difficult book to review, is the close interknitting of the ideas. In a paragraph above we have attached names to different "theories" advanced by Dr Darlington, but in reality these are so closely connected with each other that they might better be considered as parts of a whole, a united conception of nuclear cytology which is at once a consequence and a cause of the author's characteristically logical method of attack. Thus, while the immense quantity of information it contains makes this book invaluable as a reference work, its orderly arrangement makes it much more than this, justifying the adjective "stimulating" (one of the late John Belling's criticisms of the first edition was that it might be too stimulating). Its value as a reference work is increased by the tables and diagrams interspersed throughout the text and by the immense bibliography of over 1,500 references. There are also a useful appendix on interpretation, a somewhat enlarged glossary and a comprehensive index.

Among the advances included in the new edition we may mention the following, chosen more or less at random: *Inversions*; the study of structural hybrids has been greatly extended by the discovery of the consequences of chiasma formation in the relatively inverted segments in inversion hybrids. This discovery was first made by McClintock in maize, but has since been shewn to be of wide application once people knew they should look for the characteristic bridge and fragment at the first anaphase of meiosis. Such hybrids, for which the author uses the term "dyscentric", are fully treated here, with reference to their genetical as well as their cytological behaviour. *Salivary gland chromosomes*; these important structures, whose significance in *Drosophila* was demonstrated by Painter, and which are described by the author as in "permanent prophase" have proved of great value in many ways, for they enable the genetical constitution of the insect to be studied in great detail by cytological methods. There is unfortunately nothing quite like them in plants, though the use of the pachytene stage in cyto-genetic investigations in maize by McClintock and others runs a close second. Here, however, the unfortunate complication of "non-homologous pairing" enters; the author terms this "torsion pairing", considering it to be due to relational coiling rather than to a force of attraction. *Inert regions*; though the concept of inertness is not a new discovery there have been considerable developments in the study of the problem and in addition to giving an account of these Dr Darlington indulges in some highly interesting speculation on the topic. *Time of split of chromosomes*; the author's treatment of this problem is, in a way, characteristic. He gives evidence in different places to support his contention that the chromosomes split in the resting stage preceding the division at which the halves separate, but the multitudinous theories which have sprung up in recent years advocating earlier stages for the split are demolished in less than a paragraph. The author's firmness in this matter has occasioned much criticism and he has even been reproached for "turning

back the wheel of experience some two score years"; it should be noted, however, that in his critical notes on the first edition Belling, perhaps the greatest observer of them all, took the opposite view, and offered the criticism that to him the chromosomes were single at the earliest prophase of mitosis.

This is a book which might fairly be termed indispensable to cytologists and geneticists alike; whether they accept the author's ideas or not they can hardly afford to ignore them. As a work of reference its reliability, though not absolute, is extraordinarily high; in this connexion it has to be remembered that Dr Darlington's interpretation of another worker's results is often different from the original, though it may be better. The style of writing has been said to be difficult; it is certainly closely reasoned, and the book must be read slowly and more than once if the full value is to be obtained. The author's statements are usually quite unambiguous and not so hedged about with reservations as to be almost meaningless. Apart from a few misprints the production of the book is good.

CONN, H. J.

578.65

Biological stains. A handbook on the nature and uses of the dyes employed in the biological laboratory.

Published by the Commission on Standardization of Biological Stains, Geneva, N.Y. 1936: 3rd Ed.: Pp. 276. 5 figs. 5 tables.

Different branches of biology have developed widely different techniques, but stains are used in so many that they have a basic importance. The book before us, published by the United States Commission of Standardization of Biological Stains contains a great deal of information on this topic. It is now in its third edition and 23 stains have been added to the list of stains described, as well as a few more staining procedures, a feature which was first introduced in the second edition.

The first three chapters are introductory, dealing respectively with the history of staining, with the general nature of dyes and their classification and with spectrophotometric analysis. In chapters IV-IX the different stains are described and schedules are given for such methods of staining as have been tested by members of the commission. Chapter X gives a brief account of the two main theories of staining. There are four appendices containing tables relating to stains, methods of testing, general laboratory information and a bibliography. There is also a comprehensive index in which the names recommended by the Commission for different stains are indicated.

The book is naturally of most use in America where the recommendations of the Commission are in force, but much of the detailed information it contains is of general value and is here conveniently arranged for reference.

LOOMIS, W. E. and SHULL, C. A.

581.1:578.08

Methods in plant physiology.

McGraw Hill Publishing Co. Ltd., London 1937: 25s. 0d. Pp. xviii + 472.

94 figs. 45 tables.

The importance of practical work in the teaching of plant physiology can hardly be exaggerated and a book dealing exclusively with methods should therefore be of great utility wherever this subject is taught.

The book under review is divided into two parts. Part I deals with laboratory exercises which are grouped by subjects but are marked (E), (I) or (A) according to whether they are elementary, intermediate or advanced. More experiments have been included than can be covered in the usual course in plant physiology, with the object of affording the teacher as wide a choice as possible. The chapter on growth-differentiation balance includes two experiments on vernalization.

Part II is concerned with general methods. A noteworthy feature of this section is that it assumes relatively little knowledge of chemistry, physics or physical chemistry. This second part is intended for advanced students and those who are beginning research work; it does not pretend to meet all the needs of specialized research workers. The final chapter is by G. W. Snedecor and deals with statistical methods, such as testing the difference between two samples, regression and correlation and tests of homogeneity using χ^2 .

The scope of the book covers plant biochemistry as well as physiology. In this connexion it is worth mentioning that in the chapter on pigments only the four pigments of green parts are considered; the anthocyanins and flavones are not dealt with because their physiological significance is considered not to be established.

The book terminates with a very useful appendix of some 33 tables likely to be of service in physiological work and a comprehensive index. There is no bibliography, but ample references to other books and original papers are given in the text.

SCHJELDERUP-EBBE, T. 581.142:581.48:581.149
Über die Lebensfähigkeit alter Samen. (**On the vitality of old seeds**).
Skr. Norske VidenskAkad. I. Mat.-Naturv. Klasse 1935 : No. 13 : Pp. 178.
26 figs. (Published by Jacob Dybwad, Oslo 1936).

The literature on the subject is first briefly reviewed and then the methods of the author's own work are described. The seeds, which were tested in 1932-33, came from two collections made mostly during 1820-99. A few of the seeds used were of earlier date and some were collected in the first years of the present century.

Out of the 1,254 tests made, 54 germinated representing eight families and 52 different species. The oldest seed to germinate was 82 years old, *Astragalus utriger* Pall.

The results of the tests are arranged in tabular form and further brief accounts of the subsequent development of the germinated seeds are given.

A bibliography of eight pages is appended.

MOLISCH, H. 581.8
Anatomie der Pflanze. (**Plant anatomy**).
Gustav Fischer, Jena 1936 : 4th Ed. Unbound RM. 6.50. Bound RM. 8.†
Pp. viii + 160. 155 figs.

First published in 1920 the first three editions of Dr Molisch's work appeared in quick succession. It is now nearly 10 years since the publication of the third edition and the newcomer is welcome.

True to the original plan the book, always intended only as an introduction to the subject, has not been essentially enlarged but the text has been clarified and the material in several places improved and enlarged.

PETERSEN, A. 585.421
Die Gräser als Kulturpflanzen und Unkräuter auf Wiese, Weide und Acker.
(**The grasses as cultivated plants and as weeds in meadow, pasture and field**).
Reinhold Kühn, Berlin 1936 : RM. 7.20.† Pp. 224. 100 illus.

The object of this book is to enable the practical agriculturist to recognize the common grasses. The leaf characters are described and a key based on them helps towards the identification of the species. The flower characters are treated in the same way. Each grass is then separately described and illustrated by excellent drawings. In the second part the grasses are treated according to their agricultural value and in the third part the role played by the grasses as cultivated plants and as weeds in meadow, pasture and field is reviewed, including methods of cultivation.

DAHLGREN, B. E. 585.45(73)
Index of American palms. (Including Fossil palms by A. C. Noé, pp. 439-56).
Field Museum of Natural History, Chicago, U.S.A. 1936: (Bot. Ser.)
Vol. XIV: Publ. 355. \$3.00. Pp. 456.

The first 300 pages of this book are devoted to a list of the genera and species, in alphabetical order of genera, with references to literature, synonymy and lists of icones. Pre-Linnean names and polynomials are next given and then an extensive list of vernacular names. This is followed by a geographical list giving the palms occurring in the different countries and neighbouring islands of the American continent. A list of fossil palms concludes the book.

63(44)

Annuaire National de l'Agriculture, 1936-1937. (**The National Annual of Agriculture, 1936-1937**).

Société Artistique de Publications Techniques, Paris 1936: Fr. 40. Pp. 1,327. illus.

The third edition of this agricultural annual is divided into three parts; part I gives an account of the various agricultural organizations and lists of the producers and purveyors of agricultural produce arranged according to districts; part II treats of the economics and practice of agricultural production and industry throughout France and part III with administration and legislation in relation to agriculture.

HUTCHESON, T. B., WOLFE, T. K. and KIPPS, M. S.

63(73)

The production of field crops. A textbook of agronomy.

McGraw Hill Publishing Co. Ltd., London 1936: 2nd Ed.: 21s. 0d. Pp. xvii + 445. 110 figs. 62 tables.

This elementary textbook of field crops (in the U.S.A.) is stated in the authors' preface to follow the outline for a standard course adopted by the American Society of Agronomy. It has been revised for the second edition and somewhat reduced in size, so as to be better suited for a one-semester course. Much of the revision is due to the new author, M. S. Kipps. The first part of the book is devoted to general topics, beginning with history, economics, adaptation, classification, germination and growth, plant breeding and proceeding to such subjects as manures, cultivation, harvesting grain crops, haymaking, silage, grassland management, weeds and crop rotation.

In the second part the different crops are dealt with individually, the crops being classified as follows: cereals—maize, wheat, oats, barley, rye, buckwheat and rice; legumes for seed—peanuts, soya beans, cowpeas, field peas and field beans; forage crops; root crops—sweet potatoes, carrots, mangolds and turnips; fibre crops—cotton, flax and hemp; tubers—potatoes; sugar plants—beet and cane; stimulants—tobacco.

Covering such a wide field has naturally imposed upon the authors certain limitations of space, and so the treatments of the different topics tend to be concise rather than exhaustive. Mention is made of vernalization in the chapter on germination and growth.

RIKER, A. J. and RIKER, R. S.

632:578.08

Introduction to research on plant diseases. A guide to the principles and practice for studying various plant-disease problems.

Obtainable from A. J. Riker, Dept. of Plant Pathology, University of Wisconsin, Madison, U.S.A. 1936: \$2.65. Pp. iii + 119. 19 figs. 8 tables.

The book might be described as a "guide, philosopher and friend" to advanced students and research workers in plant pathology. Beginning with general considerations of methods of attacking a scientific problem and of the preliminary examination of the literature, it proceeds to give a concise account of the different techniques commonly used in plant pathology. On a military analogy, the aim of the book is to give an account of both strategy and tactics. The following chapter headings give some idea of the topics we include under tactics: General Laboratory Equipment; Culture Media; Certain Physical-Chemical Measurements; Isolation, Culture and Inoculation; Virus Diseases; Certain Procedures for Pathological Histology; Epidemiology, Environment and Control (this chapter includes a section on disease-resistant varieties); Statistical Analyses; Records and Manuscripts. The final chapter contains suggestions for laboratory exercises, again including both strategical and tactical exercises, and the book concludes with a brief appendix containing tables for converting different scales and general laboratory rules; there is also a subject index. The authors emphasize that the work is intended as an introduction rather than a complete account and provide copious references for those requiring more detailed information on a given topic. Even so the amount of information included within the covers is very great.

Though, as has been said, there is a short section on disease resistant varieties—and it is good enough to make us wish the authors had written more—the book will be more valuable to

plant breeders as a handy source of information on the technique of studying plant diseases, when they take up the important task of breeding resistant varieties. Though printed by the mimeograph or some similar process, the book is bound on wire rings and opens flat, thus avoiding a common disadvantage of such books. It is printed on both side of the paper, but blank pages for notes are provided at the end.

BUCHLI, M. 632.51(49.4)
Oekologie der Ackerunkräuter der Nordostschweiz. (**The ecology of the field weeds of north-east Switzerland**).
Beitr. Geobot. Landesaufn. 1936 : No. 19 : Pp. 354. 10 illus. Price Fr. 9.80.
(Verlag Hans Huber, Bern).

The weeds of cultivated fields of the north-eastern region of Switzerland are studied from an ecological standpoint with a view to their control.

It was found that the weeds and the crop formed an ecological association, influenced by both soil and climate and that scrupulous care of the land and the use of weed-free seed, manure, etc., were essential for keeping down the weeds.

MORSTATT, H. 632.9:016
Bibliographie der Pflanzenschutz-Literatur—das Jahr 1935. (**Bibliography of the literature on plant protection for the year 1935**).
Paul Parey, Berlin 1936 : Pp. iv + 352.

A continuation of this useful and well arranged bibliography dealing with diseases and pests with the various groups of plants subject to attack by such destructive agents, with protective measures and legislation and with statistics of the occurrence and extent of insect damage. An author index completes the volume. (Cf. "Plant Breeding Abstracts", Vol. VI, p. 333).

SWEETMAN, H. L. 632.9:576.7
The biological control of insects.
Comstock Publishing Company, Inc., Ithaca, New York 1936 : \$3.75.
Pp. xii + 461. 142 figs.

Although the principle of biological control has long been recognised, its general application is of comparatively recent development.

Courses in biological control have been introduced into the curriculum of a number of colleges and universities and the work under review is designed to supply the lack of a text-book for both students and research workers in this field.

After a general consideration of the subject the various forms of life—beginning with the lowest—that are or are likely to be of value in the biological control of pests, are described. These range from bacteria to vertebrates but the insects form the largest and most important group. There is also a chapter on the biological control of plants.

Though biological control has in some cases resulted in striking successes, it is not claimed to be the only or even the best method but where the conditions are suitable it may prove of value in conjunction with other measures.

The subject is a fascinating one and all essential aspects of it are treated impartially.

KEEBLE, F. and RAWES, A. N. 634
Hardy fruit growing.
MacMillan & Co. Ltd., London 1936: 16s. 0d. Pp. xi + 334. 21 illus.
3 figs.

In the authors' preface the objects of this book are described as first, to supply amateur and professional gardeners with the information necessary to enable them to grow fruit well and second, to provide commercial growers with an introduction to the principles and practice on which the successful growing of fruit for market must depend.

The book is divided into three sections. The first section gives a general account of hardy fruit growing in this country, beginning with the problem of where and where not to plant and proceeding through such topics as planting, cultivation and manuring, pruning, fertility and sterility, pests and diseases and propagation to harvesting and storing. The second

section gives particulars about the different fruits concerned, namely, apples, plums and damsons, pears, cherries, currants, gooseberries, strawberries, raspberries and other *Rubi*, peaches and nectarines, nuts, apricots, figs, medlars, mulberries and quinces. Whereas the first part is presented in readable form as a connected story, the second is arranged for reference. Among other things the information on varieties is to be found here. The third and shortest part deals with commercial fruit growing. A subject index is provided. The book is to be recommended for its clarity.

SANTE, E.

634.23(43)

Das deutsche Kirschenbuch. (**The German cherry book**).

Trowitzsch and Sohn, Frankfurt (Oder) and Berlin 1936 : RM. 4.75.†

Pp. 119. 105 illus.

After a short account of the development of the cultivation of cherries in Germany and the persons mainly concerned with it, the distribution of cherry orchards throughout the country is described. Then follows an account of the cultivation of sweet and sour cherries, their characteristics, the best varieties, methods of growing, grafting, etc., and the diseases of the cherry tree and their control.

The book ends with practical hints on picking and packing the fruit and some recipes for preserving it.

PIERIS, W. V. D.

634.61

An essay on the uses of the coconut palm together with an illustrated guide to coconuts.

Board of Management, Coconut Research Scheme, Ceylon 1936 : Pp. 12.

50 pls.

An account of the multitudinous uses of the coconut palm and its fruits by the natives of Ceylon and in industry, with fifty admirable photographs.

DEFRIES, A.

635.8

The book of the mushroom.

Methuen & Co. Ltd., London 1936: 5s. 0d. Pp. xiv + 130. 24 illus.

Written in a very chatty vein, this book gives information on the many problems which arise in the cultivation of mushrooms. Its chief value is that it is based on practical experience, which is probably the best, if not the only guide in this branch of horticulture to which so little research has been devoted. The author takes an almost morbid delight in setting out directly opposing statements from different advisory and other "experts". From this point of view the book should make salutary reading for advisory workers.

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